AYGM

HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Environmental and Social Impact Assessment



70069878-ESIA
DECEMBER 2021

PUBLIC

Appendix A

CONFIRMATION OF NATIONAL EIA (CHAPTER 1)

Public

T.C.
ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI
Çevresel Etki Değerlendirmesi, İzin ve Denetim Genel Müdürlüğü

Sayı :81195450-220.03-E.108009 01.06.2020
Konu :Halkalı-Kapıkule ÇED

TÜRKİYE CUMHURİYETİ DEVLET DEMİRYOLLARI İŞLETMESİ GENEL MÜDÜRLÜĞÜNE
(Etüt, Çed ve Teknik Hizmetler Şube Müdürlüğü)
Altındağ/ANKARA

İlgi : TCCD İşletmesi Genel Müdürlüğü'nün 20.05.2020 tarihli ve 68734236-611.02-E.137440 sayılı yazısı.

İlgi'de kayıtlı yazı ile; "Halkalı-Kapıkule Demiryolu" projesinin Halkalı-Çerkezköy kesiminde proje güzergahının "Kanal İstanbul" projesi ile kesişmesinden dolayı revizyon yapılmasının planlandığı belirtilerek, söz konusu değişikliğin ÇED Yönetmeliği kapsamında değerlendirilmesi istenmektedir.

İlgi yazı ve eklerinde; "Halkalı-Kapıkule Demiryolu" projesi için 12.06.2017 tarihinde "ÇED Olumlu" kararı verildiği ve projenin Çerkezköy-Kapıkule kesiminde inşaat faaliyetlerine başlandığı, ancak projenin Halkalı-Çerkezköy kesiminde güzergahın "Kanal İstanbul" projesi ile kesişmesi nedeni ile güzergahın yaklaşık 6 km'lik bölümünde Kanal İstanbul projesinin altından tünel ile geçecek şekilde proje revizyon yapılması gerektiği, planlanan revizyonun "Halkalı-Kapıkule Demiryolu" projesine esas Nihai ÇED Raporunda tanımlanan 2 km.lik inceleme koridoru içerisinde kaldığı belirtilmektedir.

İlgi'de kayıtlı yazı ve ekleri 25.11.2014 tarih ve 29186 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren ÇED Yönetmeliği kapsamında incelenmiş olup; "Halkalı-Kapıkule Demiryolu" projesinin Kanal İstanbul projesi ile kesişen 6 km.lik kesiminde planlanan revizyon ÇED Yönetmeliği'nin Ek-1 (ÇED Uygulanacak Projeler) ve Ek-2 (Seçme Eleme Kriterleri Uygulanacak Projeler) Listelerinde yer almamakta olup, bahse konu revizyon çalışmalarında *"Kanal İstanbul" ve "Halkalı-Kapıkule Demiryolu" projesi kapsamında hazırlanan Nihai ÇED Raporlarında yer alan önlem ve taahhütlere uyulması gerekmektedir.*

Ancak, söz konusu proje ile ilgili olarak, 5491 sayılı Kanunla Değişik 2872 sayılı Çevre Kanunu ve bu kanuna istinaden yayımlanarak yürürlüğe konulan yönetmeliklerin ilgili hükümlerine uyularak, diğer mer'i mevzuat çerçevesinde gerekli izinlerin alınması, ekolojik dengenin bozulmadan çevrenin korunmasına ve geliştirilmesine yönelik tedbirlere riayet edilmesi, proje kapsamında değişiklik veya kapasite artışının planlanması durumunda yeniden başvuru yapılması gerekmektedir.

Not: 5070 sayılı Elektronik İmza Kanunu gereği bu belge elektronik imza ile imzalanmıştır.

Evrak Doğrulama Kodu : GMNYMDSH Evrak Takip Adresi: https://www.turkiye.gov.tr/cevre-ve-sehircilik-bakanligi
Mustafa Kemal Mahallesi Eskişehir Devlet Yolu (Dumlupınar Bulvarı) 9. km
No:278 Çankaya /ANKARA Telefon No: (0312) 410 10 00 Faks:(0312) 419 21 92
Bilgi için:Emriye YILMAZ MOLLASALİHOĞLU
Mühendis
Telefon No:(312) 410 17 47

TCDD ETÜT VE PROJE DAİRESİ BAŞKANLIĞI	D.NO: 255.01 D.NO:
	05 Haziran 2020
Havale Eden	Havale Edilen

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T.C.
ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI
Çevresel Etki Değerlendirmesi, İzin ve Denetim Genel Müdürlüğü

Sayı :81195450-220.03-E.108009 01.06.2020
Konu :Halkalı-Kapıkule ÇED

Bilgilerinizi ve gereğini rica ederim.

e-imzalıdır
Ahmet Talha TÜRKOĞLU
Bakan a.
Genel Müdür Yardımcısı

Dağıtım:

TÜRKİYE CUMHURİYETİ DEVLET DEMİRYOLLARI İŞLETMESİ GENEL MÜDÜRLÜĞÜNE
(Etüt, Çed ve Teknik Hizmetler Şube Müdürlüğü)
İSTANBUL VALİLİĞİNE
(Çevre ve Şehircilik İl Müdürlüğü)
TEKİRDAĞ VALİLİĞİNE
(Çevre ve Şehircilik İl Müdürlüğü)

BELGENİN ASLI ELEKTRONİK İMZALIDIR
...../...../20..... 02 Haziran 2020
Ercan ÇETİN

Not: 5070 sayılı Elektronik İmza Kanunu gereği bu belge elektronik imza ile imzalanmıştır.

Evrak Doğrulama Kodu : GMNYMDSH Evrak Takip Adresi: https://www.turkiye.gov.tr/cevre-ve-sehircilik-bakanligi
Mustafa Kemal Mahallesi Eskişehir Devlet Yolu (Dumlupınar Bulvarı) 9. km No:278 Çankaya /ANKARA Telefon No: (0312) 410 10 00 Faks:(0312) 419 21 92
Bilgi için:Emriye YILMAZ MOLLASALİHOĞLU
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Appendix B

2018 FEASIBILITY STUDY: ALTERNATIVES SCORING (CHAPTER 3)

2018 Feasibility Study: Alternatives Scoring

Criteria	Sub-criteria	ALT-1	ALT-7	ALT-8
		(L = Lowest / Negative Score, M = Medium, H = Highest / Positive Score)		
Socio Economic	eIRR	L	M	H
	eNPV	L	M	H
Financial	fIRR	H	L (joint)	L (joint)
	fNPV	H	L (joint)	L (joint)
	Investment attractivity for TR MoT/TCDD.	L	H	M
	Investment attractivity for Financing Institutes other private parties.	L	M	H
	Attractivity for obtaining EU grants.	L	H (joint)	H (joint)
	Impact on TR- competitiveness.	L	H (joint)	H (joint)
Transport Impacts	Reduction of traffic/congestion on the roads.	L	H	M
	Impacts (increased use, improved connectivity) on other parts of the rail network.	L	H (joint)	H (joint)
	Increased rail network density.	L	H (joint)	H (joint)
Social Impacts	Welfare distributional impacts.	L	H (joint)	H (joint)
	Gender impacts.	L	H (joint)	H (joint)
	Construction impact to service.	H	L	M
	Number of people to be displaced.	H	M	L
Technical	Compatibility to TCDD standards.	L	H (joint)	H (joint)
Environmental	Impacts on landscape.	H	L (joint)	L (joint)
	Impacts on biodiversity.	H	L (joint)	L (joint)
	Impacts on environmentally sensitive areas.	H	L (joint)	L (joint)
	Other impacts not yet quantified.	H	L	M
Risks	Project design risks.	H	M	L
	Project construction risks.	H	L	M
	Project exploitation risks.	H	L (joint)	L (joint)

Criteria	Sub-criteria	ALT-1	ALT-7	ALT-8
		(L = Lowest / Negative Score, M = Medium, H = Highest / Positive Score)		
	Project external risks.	H	L (joint)	L (joint)
	Climate adaption included.	L	H (joint)	H (joint)

Appendix C

GLOSSARY (CHAPTER 6: AIR QUALITY)

Term	Definition
Annual Average Daily Traffic (AADT)	A daily total traffic flow (24 hrs), expressed as a mean daily flow across all 365 days of the year.
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year.
Conservative	Tending to over-predict the impact rather than under-predict.
Data capture	The percentage of all the possible measurements for a given period that were validly measured.
Defra	Department for Environment, Food and Rural Affairs.
Dust	Dust comprises particles typically in the size range 1-75 micrometres (µm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials
Exceedance	A period of time where the concentrations of a pollutant is greater than the appropriate air quality standard.
HDV/HGV	Heavy Duty Vehicle/Heavy Goods Vehicle.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 micrometres.
Road link	A length of road which is considered to have the same flow of traffic along it. Usually, a link is the road from one junction to the next.

Term	Definition
Trackout	The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction / demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site.
Micrograms per cubic metre (µg/m^3)	A measure of concentration in terms of mass per unit volume. A concentration of 1ug/m^3 means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy' and has replaced it on recent European legislation.

Appendix D

TRAFFIC DATA (CHAPTER 6: AIR QUALITY)

Table D-1 - Passenger Travel Between Çerkezköy And Halkali Without the Project

Year	Passenger Rail (Million Passenger-km travelled)	Bus (Vehicle-km travelled)	Car (Vehicle-km travelled)	Power Required for Electric Rail Operation (GWh)
2026	206	2045	14804	11.31
2027	214	2146	15536	11.79
2028	223	2253	16305	12.28
2029	233	2364	17111	12.80
2030	243	2481	17958	13.34
2031	249	2555	18494	13.71
2032	256	2631	19046	14.09
2033	263	2710	19614	14.47
2034	270	2791	20200	14.87
2035	278	2874	20802	15.28
2036	286	2960	21423	15.70
2037	293	3048	22063	16.14
2038	302	3139	22721	16.58
2039	310	3233	23399	17.04
2040	318	3329	24098	17.51
2041	325	3396	24580	17.87
2042	331	3464	25072	18.22
2043	338	3533	25573	18.59
2044	345	3604	26084	18.96
2045	352	3676	26606	19.34
2046	359	3749	27138	19.72
2047	366	3824	27681	20.12
2048	373	3901	28235	20.52
2049	381	3979	28799	20.93

Year	Passenger Rail (Million Passenger-km travelled)	Bus (Vehicle-km travelled)	Car (Vehicle-km travelled)	Power Required for Electric Rail Operation (GWh)
2050	388	4058	29375	21.35
2051	396	4140	29963	21.78
2052	404	4222	30562	22.21
2053	412	4307	31173	22.66
2054	420	4393	31797	23.11
2055	429	4481	32433	23.57

Table D-2 - Passenger Travel Between Çerkezköy and Halkali with the Project (all data provided as million passenger-km travelled unless stated)

Year	Existing Passenger Rail	Passenger Rail diverted from Buses	Passenger Rail diverted from Cars	Generated Rail Traffic	Total Rail Traffic	Power Required for Electric Rail Operation (GWh)
2026	190	55	18	18	283	19.22
2027	198	58	19	19	295	20.07
2028	206	61	20	20	308	20.96
2029	215	64	21	21	322	21.90
2030	224	67	22	22	336	22.88
2031	230	69	23	23	346	23.52
2032	237	71	24	24	356	24.19
2033	243	73	24	24	366	24.87
2034	250	76	25	25	376	25.58
2035	257	78	26	26	387	26.30
2036	264	80	27	27	398	27.05
2037	271	83	28	28	409	27.82
2038	279	85	28	28	421	28.61

Year	Existing Passenger Rail	Passenger Rail diverted from Buses	Passenger Rail diverted from Cars	Generated Rail Traffic	Total Rail Traffic	Power Required for Electric Rail Operation (GWh)
2039	286	88	29	29	433	29.42
2040	294	90	30	30	445	30.25
2041	300	92	31	31	454	30.86
2042	306	94	31	31	463	31.48
2043	312	96	32	32	472	32.10
2044	319	98	33	33	482	32.75
2045	325	100	33	33	491	33.40
2046	332	102	34	34	501	34.07
2047	338	104	35	35	511	34.75
2048	345	106	35	35	521	35.45
2049	352	108	36	36	532	36.16
2050	359	110	37	37	542	36.88
2051	366	112	37	37	553	37.62
2052	373	115	38	38	564	38.37
2053	381	117	39	39	576	39.14
2054	388	119	40	40	587	39.92
2055	396	122	41	41	599	40.72

Table D-3 - Freight Travel Between Çerkezköy and Halkali Without the Project

Year	Rail NTK (MegaTonne-km)	HDV Marmaray crossing (KiloVeh-km)	HDV 3rd Crossing (KiloVeh-km)	Power Required for Electric Rail Operation (GWh)
2026	103	6467	0	5.45
2027	111	6708	0	5.91
2028	121	6958	0	6.44

Year	Rail NTK (MegaTonne-km)	HDV Marmaray crossing (KiloVeh-km)	HDV 3rd Crossing (KiloVeh-km)	Power Required for Electric Rail Operation (GWh)
2029	133	7218	0	7.05
2030	145	7398	28125	7.70
2031	147	7583	30144	7.82
2032	150	7773	32307	7.93
2033	152	7967	34626	8.05
2034	154	8166	37111	8.17
2035	157	8371	39775	8.30
2036	159	8580	42630	8.43
2037	162	8794	45689	8.56
2038	164	9014	48968	8.70
2039	167	9240	52483	8.83
2040	169	9471	56250	8.98
2041	172	9707	57656	9.12
2042	175	9950	59098	9.27
2043	178	10199	60575	9.42
2044	181	10454	62089	9.58
2045	184	10715	63642	9.74
2046	187	10983	65233	9.91
2047	190	11258	66864	10.08
2048	193	11539	68535	10.25
2049	197	11827	70249	10.43
2050	200	12123	72005	10.61
2051	204	12426	73805	10.79
2052	207	12737	75650	10.98

Year	Rail NTK (MegaTonne-km)	HDV Marmaray crossing (KiloVeh-km)	HDV 3rd Crossing (KiloVeh-km)	Power Required for Electric Rail Operation (GWh)
2053	211	13055	77541	11.18
2054	215	13382	79480	11.38
2055	219	13716	81467	11.59

Table D-4 - Freight Travel Between Çerkezköy and Halkali With the Project (all values presented as Net Tonne Kilometres (NTK) in MegaTonne-km unless otherwise stated)

Year	Rail NTK (MegaTonne-km)	HDV Marmaray crossing (Thousand Veh-km)	HDV 3rd Crossing (Thousand Veh-km)	Power Required for Electric Rail Operation (GWh)
2026	90	78	0	7.03
2027	97	80	0	7.47
2028	106	83	0	7.96
2029	116	87	0	8.52
2030	127	89	338	23.24
2031	129	91	362	24.43
2032	131	93	388	25.69
2033	133	96	416	27.04
2034	135	98	445	28.48
2035	137	100	477	30.01
2036	139	103	512	31.64
2037	141	106	548	33.39
2038	143	108	588	35.24
2039	146	111	630	37.22
2040	148	114	675	39.34
2041	150	116	692	40.27
2042	153	119	709	41.22

Year	Rail NTK (MegaTonne-km)	HDV Marmaray crossing (Thousand Veh-km)	HDV 3rd Crossing (Thousand Veh-km)	Power Required for Electric Rail Operation (GWh)
2043	155	122	727	42.19
2044	158	125	745	43.19
2045	161	129	764	44.22
2046	163	132	783	45.27
2047	166	135	802	46.35
2048	169	138	822	47.45
2049	172	142	843	48.58
2050	175	145	864	49.74
2051	178	149	886	50.93
2052	181	153	908	52.15
2053	184	157	930	53.40
2054	188	161	954	54.68
2055	191	165	978	55.99

Appendix E

EMISSIONS (CHAPTER 6: AIR QUALITY)

Table E-1 - Total Emissions from Road-Based Sources Within Turkey for 2018[322]

2018 Road Vehicle Emissions	NOx		PM_{10}	
	124	Gg/yr	8.86	Gg/yr

Table E-2 - Vehicular Split of Emissions For Road-Based Emissions in Turkey for 2018[13]

Vehicle Type	NOx		PM_{10}	
	% Split	Emissions (Gg/yr)	% Split	Emissions (Gg/yr)
HGV	68%	84.32	35%	3.101
LGV	10%	12.4	13%	1.1518
Cars	22%	27.28	6%	0.5316
Break & Tyre Wear	-	-	46%	4.0756

Table E-3 - Vehicular Split[323] of Passenger Kilometres Travelled in Turkey for 2018 (total passenger travel of 329,363 million passenger kilometres)[324]

Vehicle	% Split	Passenger-km (Million)
Trains	2%	6587.3
Buses	28%	92221.6
Cars	70%	230554.1

The data from tables D1-3 were utilised to calculate a 2018 emission rate for Cars. This emission rate was consistent with EFT emissions for 2017, as discussed in the main body of the report. The final emission rates utilised in the assessment are presented in Table E-4, below, where the car emission rate was calculated using the 2018 emissions data for Turkey, and the Bus and HDV emission rates were taken from the EFT.

[322] Data Taken from www.eea.europa.eu/data-and-maps/dashboards/air-pollutant-emissions-data-viewer-3
[323] Data Taken from knoema.com/tran_hv_psmod/modal-split-of-passenger-transport?geo=1032720-turkey
[324] Data taken from data.oecd.org/transport/passenger-transport.htm

Table E-4 - Finalised Vehicle Emission Rates used in the Calculation of Regional Emissions (all values shown in g/km)

Pollutant	Car Emission Rate	Bus Emission Rate	HDV Emission Rate
NO_x	0.084517	2.6773	1.5809
PM_{10}	0.003050	0.1202	0.1141

To account for the changes in emissions from electrified rail, an emission rate for the Turkish national grid was calculated using data from 2018. The total electricity generated, total emissions from electricity generation, and final emission rate used are presented in Table E-5, below.

Table E-5 - Finalised Emission Rates used in the Calculation of Regional Emissions (all values shown in g/km)

Total Electricity generated in Turkey (TWh/yr)	Pollutant	Emissions from electricity generation (Kilotonnes/yr)	Emission rate (g/kWh)
297.3	NOx	358.9	1.20729
	PM_{10}	13.7	0.04592

19.6.3. Using the emission rates calculated above and the traffic data presented in Appendix V, the total NOx and PM10 emissions were calculated and are presented in the main body of the report.

Appendix F

WIND ROSES (CHAPTER 6: AIR QUALITY)

WIND ROSES

This appendix contains the wind roses used within this assessment.

ANNUAL CONDITIONS

The following wind roses are from Corlu and Ataturk Airfield, generated using a full year of met data from 2017 – 2019.

CORLU

Figure F-1 - Corlu Wind Rose 2017

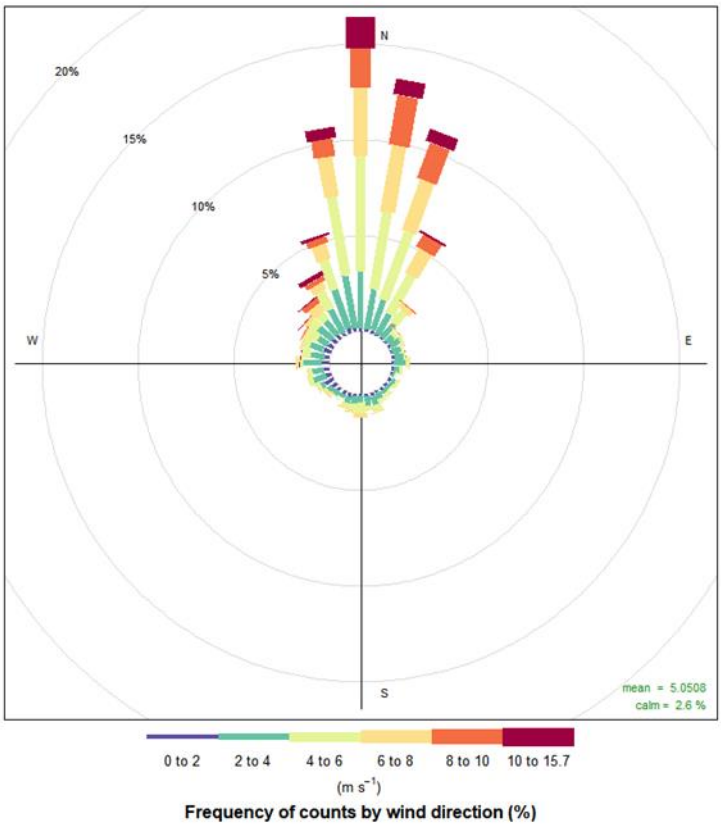


Figure F-2 - Corlu Wind Rose 2018

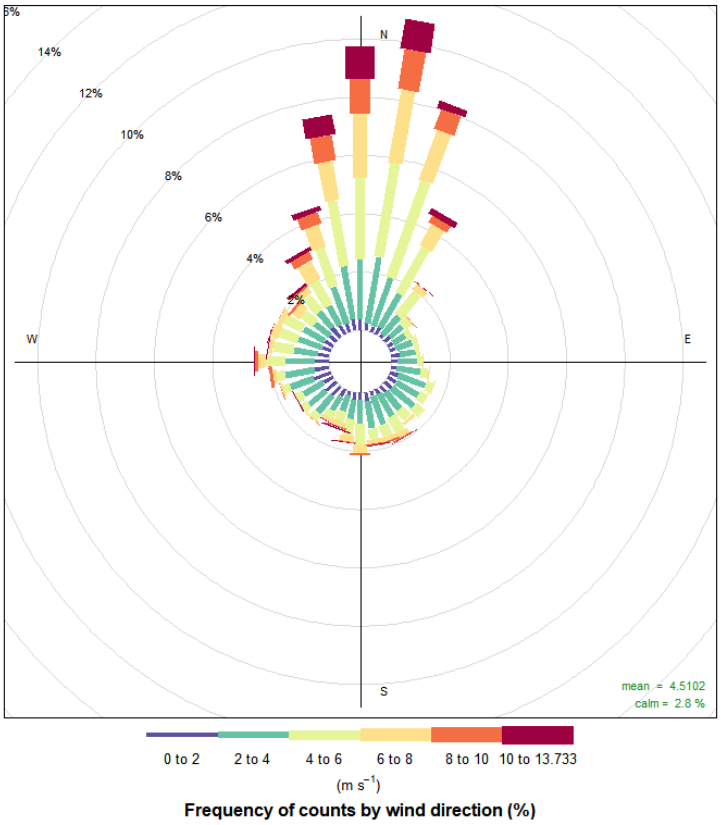
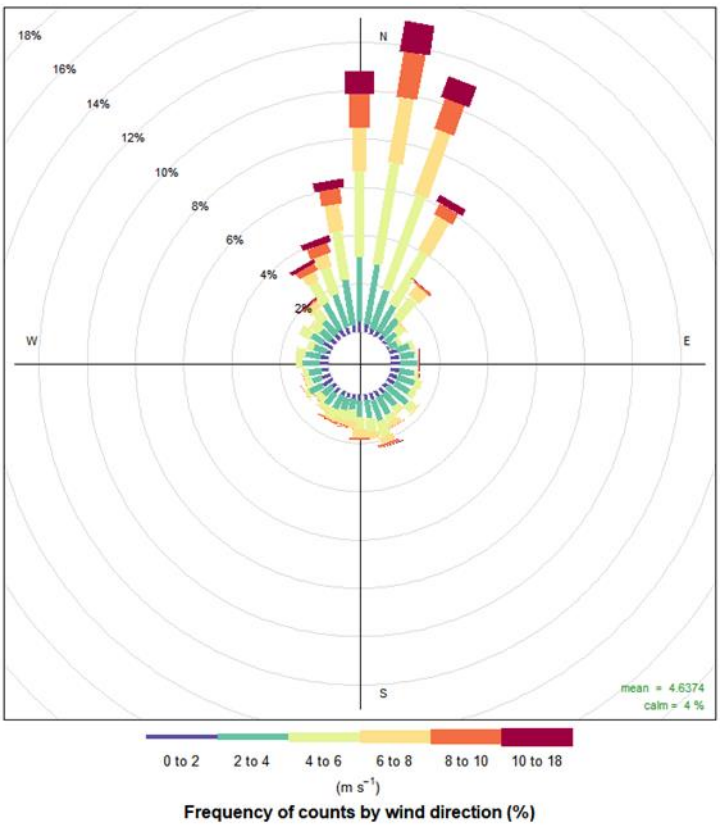


Figure F-3 - Corlu Wind Rose 2019



ATATURK AIRPORT

Figure F-4 - Ataturk Airport Wind Rose 2017

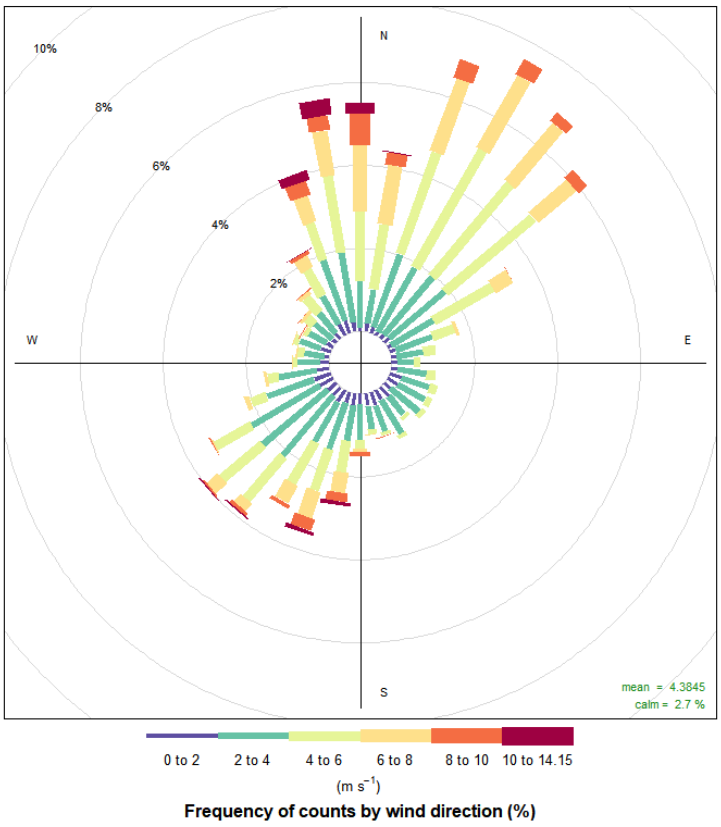


Figure F-5 - Ataturk Airport Wind Rose 2018

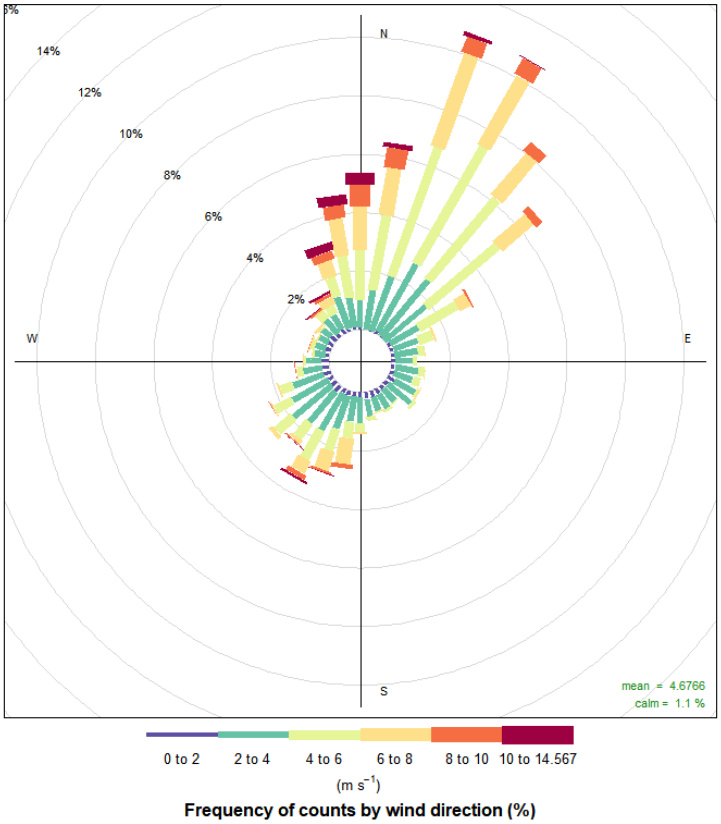
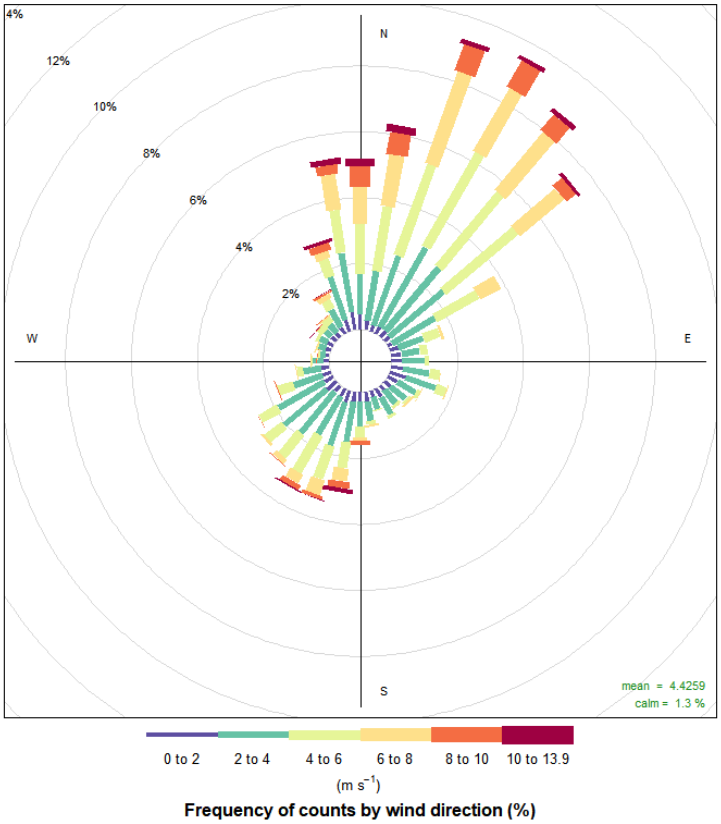


Figure F-6 - Ataturk Airport Wind Rose 2019



WSP MONITORING PERIOD WIND ROSE

Below are the wind roses for Catalca met station for the dispersion patterns over the sampling period for WSP's PM_{10} monitoring.

At the time of writing meteorological data was only available up to the 25/07/2020, covering monitoring at locations 1 and 3. Data is still pending from locations 2 and 4, and will be updated in due course.

CATALCA

Figure F-7 - Catalca Overview Wind Rose 01/07/2020 - 23/07/2020

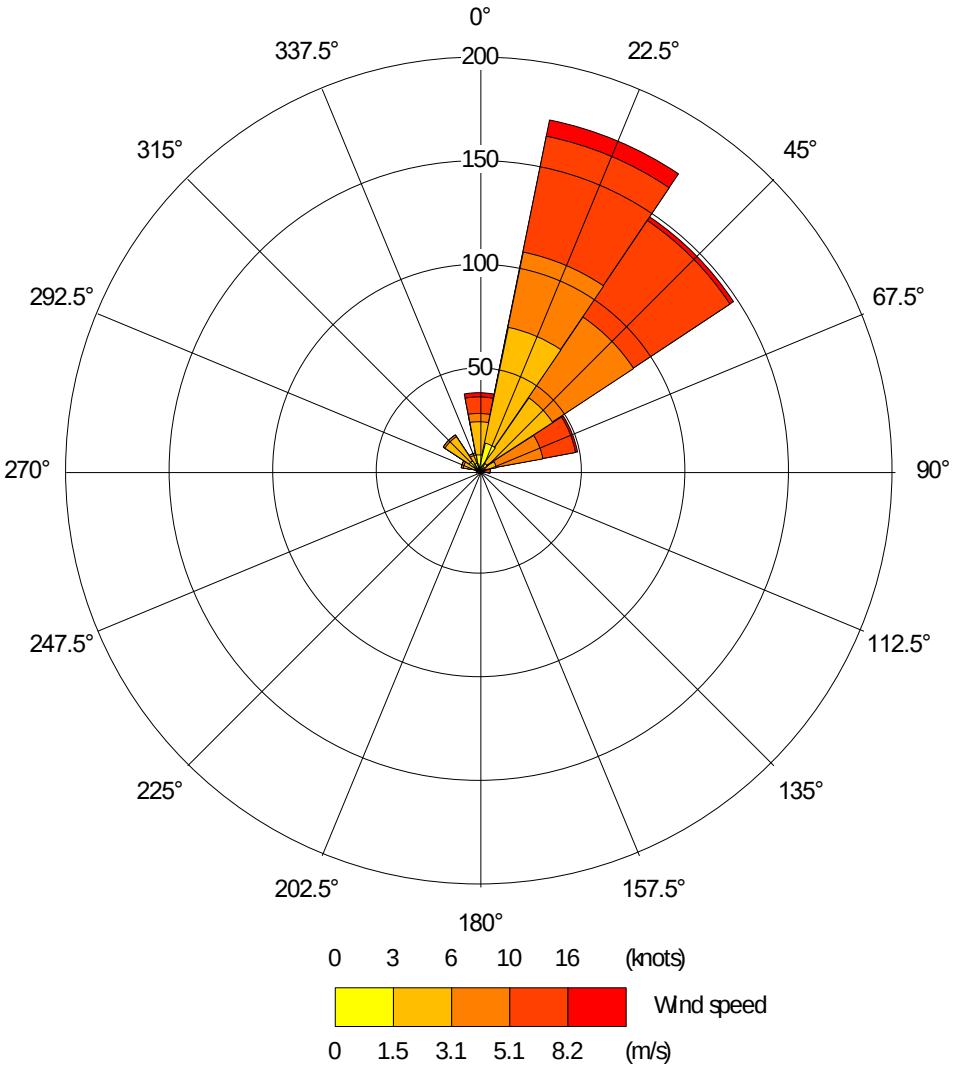


Figure F-8 - Catalca Wind Rose For Monitoring Period 1 (Location 1) - 04/07/2020 - 11/07/2020

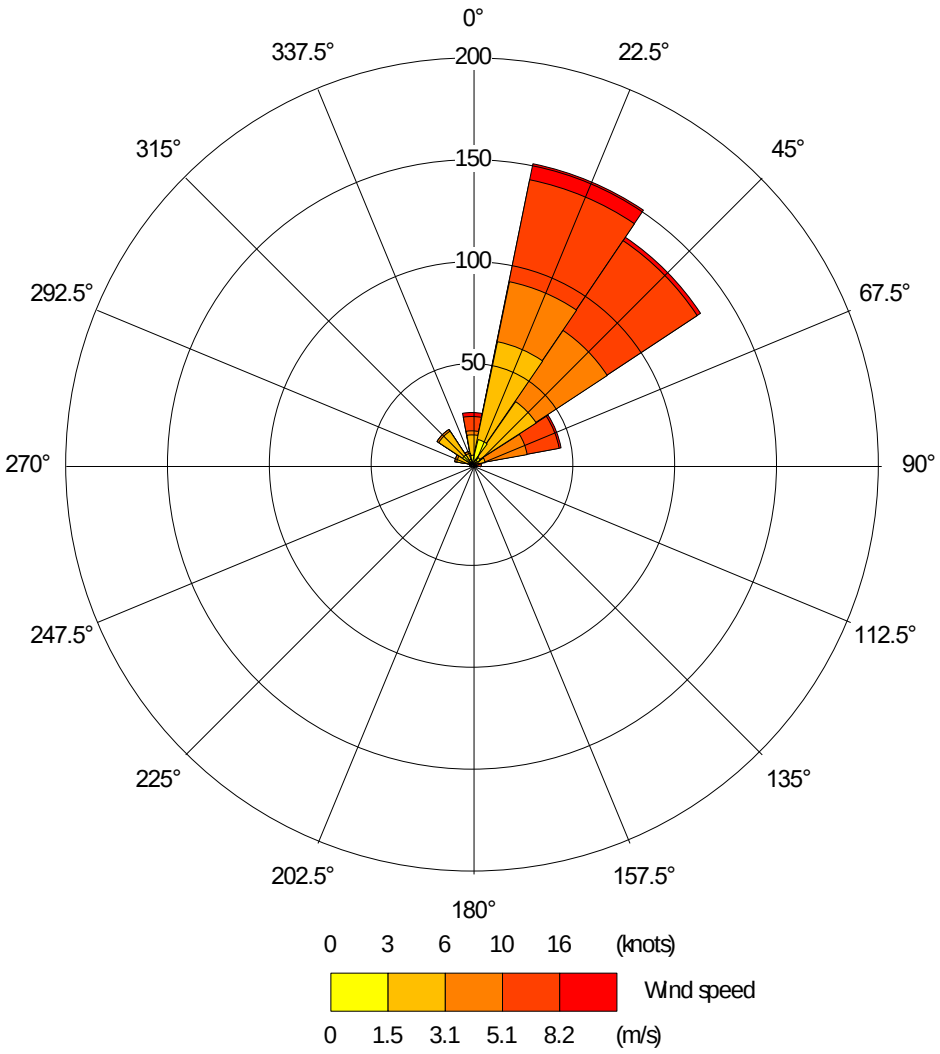
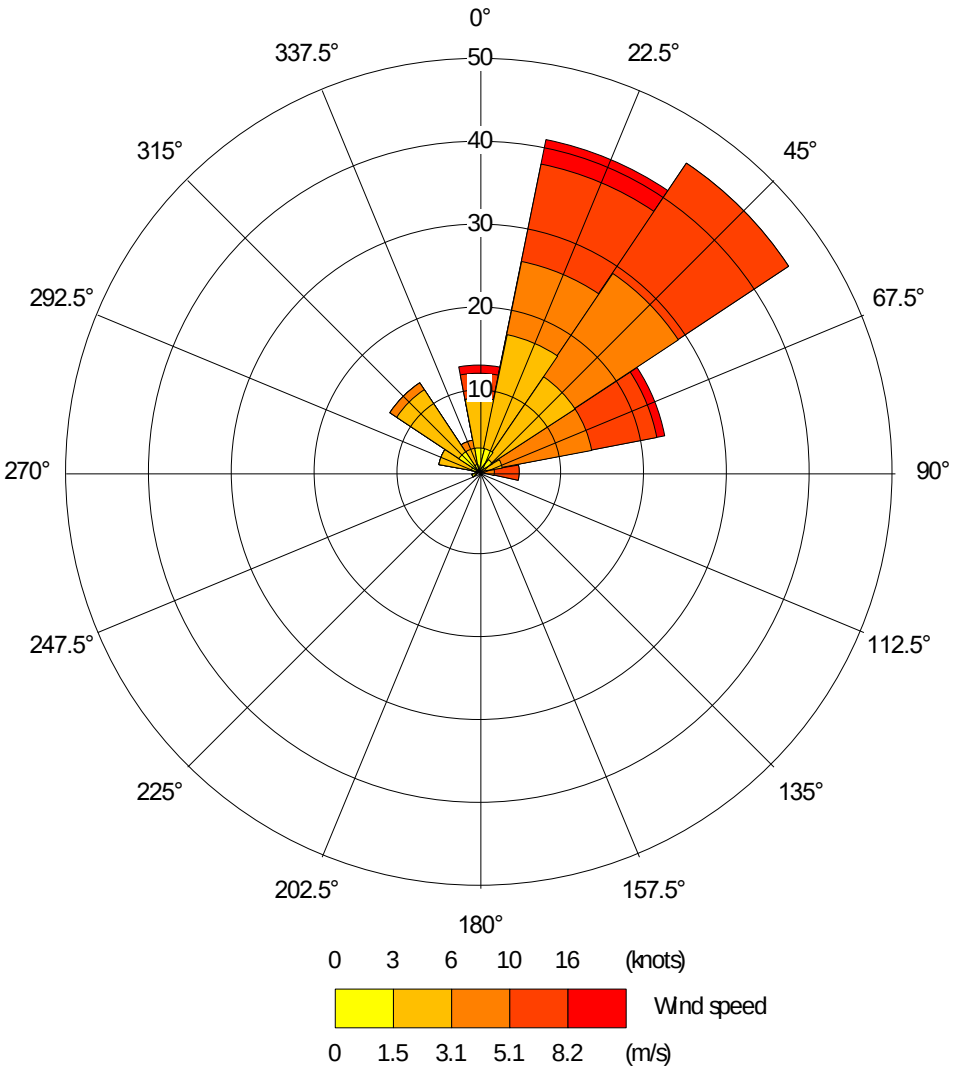


Figure F-9 - Catalca Wind Rose Period 2 (Location 3) - 11/07/2020 - 18/07/2020



Appendix G

FULL PM MONITORING DATA (CHAPTER 6: AIR QUALITY)

LOCATION 1

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
04/07/2020	13:00	14:00	56
04/07/2020	14:00	15:00	38
04/07/2020	15:00	16:00	40
04/07/2020	16:00	17:00	38
04/07/2020	17:00	18:00	36
04/07/2020	18:00	19:00	38
04/07/2020	19:00	20:00	38
04/07/2020	20:00	21:00	33
04/07/2020	21:00	22:00	29
04/07/2020	22:00	23:00	23
04/07/2020	23:00	00:00	22
05/07/2020	00:00	01:00	20
05/07/2020	01:00	02:00	18
05/07/2020	02:00	03:00	24
05/07/2020	03:00	04:00	20
05/07/2020	04:00	05:00	15
05/07/2020	05:00	06:00	18
05/07/2020	06:00	07:00	13
05/07/2020	07:00	08:00	21
05/07/2020	08:00	09:00	22
05/07/2020	09:00	10:00	28
05/07/2020	10:00	11:00	27
05/07/2020	11:00	12:00	35
05/07/2020	12:00	13:00	34

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
05/07/2020	13:00	14:00	30
05/07/2020	14:00	15:00	30
05/07/2020	15:00	16:00	30
05/07/2020	16:00	17:00	36
05/07/2020	17:00	18:00	37
05/07/2020	18:00	19:00	40
05/07/2020	19:00	20:00	27
05/07/2020	20:00	21:00	34
05/07/2020	21:00	22:00	31
05/07/2020	22:00	23:00	29
05/07/2020	23:00	00:00	30
06/07/2020	00:00	01:00	24
06/07/2020	01:00	02:00	24
06/07/2020	02:00	03:00	26
06/07/2020	03:00	04:00	21
06/07/2020	04:00	05:00	24
06/07/2020	05:00	06:00	26
06/07/2020	06:00	07:00	18
06/07/2020	07:00	08:00	22
06/07/2020	08:00	09:00	23
06/07/2020	09:00	10:00	24
06/07/2020	10:00	11:00	26
06/07/2020	11:00	12:00	34
06/07/2020	12:00	13:00	32
06/07/2020	13:00	14:00	33

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
06/07/2020	14:00	15:00	37
06/07/2020	15:00	16:00	46
06/07/2020	16:00	17:00	35
06/07/2020	17:00	18:00	34
06/07/2020	18:00	19:00	40
06/07/2020	19:00	20:00	25
06/07/2020	20:00	21:00	31
06/07/2020	21:00	22:00	35
06/07/2020	22:00	23:00	30
06/07/2020	23:00	00:00	31
07/07/2020	00:00	01:00	27
07/07/2020	01:00	02:00	18
07/07/2020	02:00	03:00	26
07/07/2020	03:00	04:00	24
07/07/2020	04:00	05:00	29
07/07/2020	05:00	06:00	27
07/07/2020	06:00	07:00	36
07/07/2020	07:00	08:00	33
07/07/2020	08:00	09:00	36
07/07/2020	09:00	10:00	42
07/07/2020	10:00	11:00	49
07/07/2020	11:00	12:00	42
07/07/2020	12:00	13:00	45
07/07/2020	13:00	14:00	41
07/07/2020	14:00	15:00	45

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
07/07/2020	15:00	16:00	52
07/07/2020	16:00	17:00	46
07/07/2020	17:00	18:00	45
07/07/2020	18:00	19:00	48
07/07/2020	19:00	20:00	33
07/07/2020	20:00	21:00	36
07/07/2020	21:00	22:00	35
07/07/2020	22:00	23:00	35
07/07/2020	23:00	00:00	50
08/07/2020	00:00	01:00	27
08/07/2020	01:00	02:00	13
08/07/2020	02:00	03:00	19
08/07/2020	03:00	04:00	13
08/07/2020	04:00	05:00	12
08/07/2020	05:00	06:00	9
08/07/2020	06:00	07:00	9
08/07/2020	07:00	08:00	17
08/07/2020	08:00	09:00	15
08/07/2020	09:00	10:00	14
08/07/2020	10:00	11:00	13
08/07/2020	11:00	12:00	13
08/07/2020	12:00	13:00	13
08/07/2020	13:00	14:00	13
08/07/2020	14:00	15:00	11
08/07/2020	15:00	16:00	10

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
08/07/2020	16:00	17:00	12
08/07/2020	17:00	18:00	10
08/07/2020	18:00	19:00	11
08/07/2020	19:00	20:00	13
08/07/2020	20:00	21:00	18
08/07/2020	21:00	22:00	21
08/07/2020	22:00	23:00	14
08/07/2020	23:00	00:00	10
09/07/2020	00:00	01:00	5
09/07/2020	01:00	02:00	7
09/07/2020	02:00	03:00	9
09/07/2020	03:00	04:00	8
09/07/2020	04:00	05:00	8
09/07/2020	05:00	06:00	7
09/07/2020	06:00	07:00	7
09/07/2020	07:00	08:00	11
09/07/2020	08:00	09:00	16
09/07/2020	09:00	10:00	20
09/07/2020	10:00	11:00	16
09/07/2020	11:00	12:00	20
09/07/2020	12:00	13:00	18
09/07/2020	13:00	14:00	13
09/07/2020	14:00	15:00	14
09/07/2020	15:00	16:00	22
09/07/2020	16:00	17:00	20

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
09/07/2020	17:00	18:00	22
09/07/2020	18:00	19:00	20
09/07/2020	19:00	20:00	17
09/07/2020	20:00	21:00	24
09/07/2020	21:00	22:00	13
09/07/2020	22:00	23:00	17
09/07/2020	23:00	00:00	14
10/07/2020	00:00	01:00	12
10/07/2020	01:00	02:00	12
10/07/2020	02:00	03:00	12
10/07/2020	03:00	04:00	9
10/07/2020	04:00	05:00	11
10/07/2020	05:00	06:00	11
10/07/2020	06:00	07:00	10
10/07/2020	07:00	08:00	10
10/07/2020	08:00	09:00	19
10/07/2020	09:00	10:00	12
10/07/2020	10:00	11:00	19
10/07/2020	11:00	12:00	17
10/07/2020	12:00	13:00	15
10/07/2020	13:00	14:00	15
10/07/2020	14:00	15:00	19
10/07/2020	15:00	16:00	14
10/07/2020	16:00	17:00	22
10/07/2020	17:00	18:00	21

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
10/07/2020	18:00	19:00	22
10/07/2020	19:00	20:00	24
10/07/2020	20:00	21:00	21
10/07/2020	21:00	22:00	22
10/07/2020	22:00	23:00	16
10/07/2020	23:00	00:00	18
11/07/2020	00:00	01:00	18
11/07/2020	01:00	02:00	16
11/07/2020	02:00	03:00	23
11/07/2020	03:00	04:00	24
11/07/2020	04:00	05:00	18
11/07/2020	05:00	06:00	25
11/07/2020	06:00	07:00	21
11/07/2020	07:00	08:00	24
11/07/2020	08:00	09:00	23
11/07/2020	09:00	10:00	25
11/07/2020	10:00	11:00	26
11/07/2020	11:00	12:00	22
11/07/2020	12:00	13:00	24

LOCATION 2

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
25/07/2020	13:00	14:00	22
25/07/2020	14:00	15:00	16

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
25/07/2020	15:00	16:00	19
25/07/2020	16:00	17:00	19
25/07/2020	17:00	18:00	16
25/07/2020	18:00	19:00	15
25/07/2020	19:00	20:00	14
25/07/2020	20:00	21:00	26
25/07/2020	21:00	22:00	17
25/07/2020	22:00	23:00	15
25/07/2020	23:00	00:00	14
26/07/2020	00:00	01:00	13
26/07/2020	01:00	02:00	12
26/07/2020	02:00	03:00	12
26/07/2020	03:00	04:00	9
26/07/2020	04:00	05:00	5
26/07/2020	05:00	06:00	7
26/07/2020	06:00	07:00	11
26/07/2020	07:00	08:00	13
26/07/2020	08:00	09:00	13
26/07/2020	09:00	10:00	12
26/07/2020	10:00	11:00	18
26/07/2020	11:00	12:00	13
26/07/2020	12:00	13:00	19
26/07/2020	13:00	14:00	23
26/07/2020	14:00	15:00	18
26/07/2020	15:00	16:00	19

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
26/07/2020	16:00	17:00	23
26/07/2020	17:00	18:00	23
26/07/2020	18:00	19:00	23
26/07/2020	19:00	20:00	18
26/07/2020	20:00	21:00	22
26/07/2020	21:00	22:00	30
26/07/2020	22:00	23:00	15
26/07/2020	23:00	00:00	14
27/07/2020	00:00	01:00	13
27/07/2020	01:00	02:00	14
27/07/2020	02:00	03:00	11
27/07/2020	03:00	04:00	7
27/07/2020	04:00	05:00	6
27/07/2020	05:00	06:00	8
27/07/2020	06:00	07:00	9
27/07/2020	07:00	08:00	7
27/07/2020	08:00	09:00	10
27/07/2020	09:00	10:00	12
27/07/2020	10:00	11:00	13
27/07/2020	11:00	12:00	13
27/07/2020	12:00	13:00	9
27/07/2020	13:00	14:00	9
27/07/2020	14:00	15:00	17
27/07/2020	15:00	16:00	17
27/07/2020	16:00	17:00	13

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
27/07/2020	17:00	18:00	17
27/07/2020	18:00	19:00	11
27/07/2020	19:00	20:00	24
27/07/2020	20:00	21:00	24
27/07/2020	21:00	22:00	14
27/07/2020	22:00	23:00	14
27/07/2020	23:00	00:00	20
28/07/2020	00:00	01:00	9
28/07/2020	01:00	02:00	7
28/07/2020	02:00	03:00	4
28/07/2020	03:00	04:00	3
28/07/2020	04:00	05:00	6
28/07/2020	05:00	06:00	8
28/07/2020	06:00	07:00	10
28/07/2020	07:00	08:00	12
28/07/2020	08:00	09:00	15
28/07/2020	09:00	10:00	16
28/07/2020	10:00	11:00	15
28/07/2020	11:00	12:00	20
28/07/2020	12:00	13:00	19
28/07/2020	13:00	14:00	20
28/07/2020	14:00	15:00	23
28/07/2020	15:00	16:00	17
28/07/2020	16:00	17:00	18
28/07/2020	17:00	18:00	17

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
28/07/2020	18:00	19:00	15
28/07/2020	19:00	20:00	17
28/07/2020	20:00	21:00	13
28/07/2020	21:00	22:00	17
28/07/2020	22:00	23:00	11
28/07/2020	23:00	00:00	13
29/07/2020	00:00	01:00	13
29/07/2020	01:00	02:00	11
29/07/2020	02:00	03:00	12
29/07/2020	03:00	04:00	13
29/07/2020	04:00	05:00	12
29/07/2020	05:00	06:00	12
29/07/2020	06:00	07:00	17
29/07/2020	07:00	08:00	14
29/07/2020	08:00	09:00	18
29/07/2020	09:00	10:00	23
29/07/2020	10:00	11:00	18
29/07/2020	11:00	12:00	26
29/07/2020	12:00	13:00	17
29/07/2020	13:00	14:00	29
29/07/2020	14:00	15:00	29
29/07/2020	15:00	16:00	29
29/07/2020	16:00	17:00	18
29/07/2020	17:00	18:00	15
29/07/2020	18:00	19:00	27

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
29/07/2020	19:00	20:00	22
29/07/2020	20:00	21:00	11
29/07/2020	21:00	22:00	19
29/07/2020	22:00	23:00	25
29/07/2020	23:00	00:00	8
30/07/2020	00:00	01:00	6
30/07/2020	01:00	02:00	8
30/07/2020	02:00	03:00	6
30/07/2020	03:00	04:00	9
30/07/2020	04:00	05:00	7
30/07/2020	05:00	06:00	10
30/07/2020	06:00	07:00	9
30/07/2020	07:00	08:00	12
30/07/2020	08:00	09:00	21
30/07/2020	09:00	10:00	20
30/07/2020	10:00	11:00	25
30/07/2020	11:00	12:00	19
30/07/2020	12:00	13:00	17
30/07/2020	13:00	14:00	22
30/07/2020	14:00	15:00	16
30/07/2020	15:00	16:00	19
30/07/2020	16:00	17:00	21
30/07/2020	17:00	18:00	18
30/07/2020	18:00	19:00	8
30/07/2020	19:00	20:00	25

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
30/07/2020	20:00	21:00	21
30/07/2020	21:00	22:00	14
30/07/2020	22:00	23:00	11
30/07/2020	23:00	00:00	20
31/07/2020	00:00	01:00	8
31/07/2020	01:00	02:00	4
31/07/2020	02:00	03:00	4
31/07/2020	03:00	04:00	3
31/07/2020	04:00	05:00	3
31/07/2020	05:00	06:00	6
31/07/2020	06:00	07:00	15
31/07/2020	07:00	08:00	9
31/07/2020	08:00	09:00	12
31/07/2020	09:00	10:00	13
31/07/2020	10:00	11:00	16
31/07/2020	11:00	12:00	19
31/07/2020	12:00	13:00	21
31/07/2020	13:00	14:00	17
31/07/2020	14:00	15:00	20
31/07/2020	15:00	16:00	14
31/07/2020	16:00	17:00	22
31/07/2020	17:00	18:00	15
31/07/2020	18:00	19:00	20
31/07/2020	19:00	20:00	11
31/07/2020	20:00	21:00	22

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
31/07/2020	21:00	22:00	29
31/07/2020	22:00	23:00	16
31/07/2020	23:00	00:00	18
01/08/2020	00:00	01:00	25
01/08/2020	01:00	02:00	7
01/08/2020	02:00	03:00	10
01/08/2020	03:00	04:00	5
01/08/2020	04:00	05:00	7
01/08/2020	05:00	06:00	9
01/08/2020	06:00	07:00	15
01/08/2020	07:00	08:00	22
01/08/2020	08:00	09:00	25
01/08/2020	09:00	10:00	24
01/08/2020	10:00	11:00	24
01/08/2020	11:00	12:00	22
01/08/2020	12:00	13:00	21

LOCATION 3

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
11/07/2020	14:00	15:00	41
11/07/2020	15:00	16:00	29
11/07/2020	16:00	17:00	35
11/07/2020	17:00	18:00	27
11/07/2020	18:00	19:00	Invalid Data*

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
11/07/2020	19:00	20:00	28
11/07/2020	20:00	21:00	26
11/07/2020	21:00	22:00	21
11/07/2020	22:00	23:00	21
11/07/2020	23:00	00:00	20
12/07/2020	00:00	01:00	12
12/07/2020	01:00	02:00	20
12/07/2020	02:00	03:00	18
12/07/2020	03:00	04:00	14
12/07/2020	04:00	05:00	13
12/07/2020	05:00	06:00	15
12/07/2020	06:00	07:00	17
12/07/2020	07:00	08:00	19
12/07/2020	08:00	09:00	18
12/07/2020	09:00	10:00	23
12/07/2020	10:00	11:00	32
12/07/2020	11:00	12:00	41
12/07/2020	12:00	13:00	38
12/07/2020	13:00	14:00	34
12/07/2020	14:00	15:00	43
12/07/2020	15:00	16:00	27
12/07/2020	16:00	17:00	34
12/07/2020	17:00	18:00	27
12/07/2020	18:00	19:00	29
12/07/2020	19:00	20:00	42

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
12/07/2020	20:00	21:00	42
12/07/2020	21:00	22:00	19
12/07/2020	22:00	23:00	20
12/07/2020	23:00	00:00	22
13/07/2020	00:00	01:00	20
13/07/2020	01:00	02:00	17
13/07/2020	02:00	03:00	21
13/07/2020	03:00	04:00	22
13/07/2020	04:00	05:00	35
13/07/2020	05:00	06:00	45
13/07/2020	06:00	07:00	44
13/07/2020	07:00	08:00	29
13/07/2020	08:00	09:00	25
13/07/2020	09:00	10:00	23
13/07/2020	10:00	11:00	33
13/07/2020	11:00	12:00	41
13/07/2020	12:00	13:00	41
13/07/2020	13:00	14:00	43
13/07/2020	14:00	15:00	39
13/07/2020	15:00	16:00	35
13/07/2020	16:00	17:00	34
13/07/2020	17:00	18:00	39
13/07/2020	18:00	19:00	29
13/07/2020	19:00	20:00	29
13/07/2020	20:00	21:00	28

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
13/07/2020	21:00	22:00	27
13/07/2020	22:00	23:00	24
13/07/2020	23:00	00:00	22
14/07/2020	00:00	01:00	18
14/07/2020	01:00	02:00	18
14/07/2020	02:00	03:00	15
14/07/2020	03:00	04:00	19
14/07/2020	04:00	05:00	15
14/07/2020	05:00	06:00	14
14/07/2020	06:00	07:00	22
14/07/2020	07:00	08:00	29
14/07/2020	08:00	09:00	32
14/07/2020	09:00	10:00	36
14/07/2020	10:00	11:00	39
14/07/2020	11:00	12:00	39
14/07/2020	12:00	13:00	45
14/07/2020	13:00	14:00	44
14/07/2020	14:00	15:00	41
14/07/2020	15:00	16:00	23
14/07/2020	16:00	17:00	16
14/07/2020	17:00	18:00	20
14/07/2020	18:00	19:00	25
14/07/2020	19:00	20:00	16
14/07/2020	20:00	21:00	10
14/07/2020	21:00	22:00	10

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
14/07/2020	22:00	23:00	10
14/07/2020	23:00	00:00	8
15/07/2020	00:00	01:00	6
15/07/2020	01:00	02:00	7
15/07/2020	02:00	03:00	8
15/07/2020	03:00	04:00	9
15/07/2020	04:00	05:00	7
15/07/2020	05:00	06:00	Invalid Data*
15/07/2020	06:00	07:00	6
15/07/2020	07:00	08:00	7
15/07/2020	08:00	09:00	26
15/07/2020	09:00	10:00	25
15/07/2020	10:00	11:00	16
15/07/2020	11:00	12:00	24
15/07/2020	12:00	13:00	Invalid Data*
15/07/2020	13:00	14:00	23
15/07/2020	14:00	15:00	17
15/07/2020	15:00	16:00	20
15/07/2020	16:00	17:00	12
15/07/2020	17:00	18:00	11
15/07/2020	18:00	19:00	11
15/07/2020	19:00	20:00	19
15/07/2020	20:00	21:00	18
15/07/2020	21:00	22:00	11
15/07/2020	22:00	23:00	6

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
15/07/2020	23:00	00:00	3
16/07/2020	00:00	01:00	4
16/07/2020	01:00	02:00	6
16/07/2020	02:00	03:00	4
16/07/2020	03:00	04:00	4
16/07/2020	04:00	05:00	4
16/07/2020	05:00	06:00	4
16/07/2020	06:00	07:00	7
16/07/2020	07:00	08:00	28
16/07/2020	08:00	09:00	32
16/07/2020	09:00	10:00	33
16/07/2020	10:00	11:00	37
16/07/2020	11:00	12:00	19
16/07/2020	12:00	13:00	12
16/07/2020	13:00	14:00	27
16/07/2020	14:00	15:00	14
16/07/2020	15:00	16:00	22
16/07/2020	16:00	17:00	36
16/07/2020	17:00	18:00	22
16/07/2020	18:00	19:00	29
16/07/2020	19:00	20:00	26
16/07/2020	20:00	21:00	11
16/07/2020	21:00	22:00	9
16/07/2020	22:00	23:00	16
16/07/2020	23:00	00:00	Invalid Data*

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
17/07/2020	00:00	01:00	5
17/07/2020	01:00	02:00	6
17/07/2020	02:00	03:00	6
17/07/2020	03:00	04:00	8
17/07/2020	04:00	05:00	Invalid Data*
17/07/2020	05:00	06:00	11
17/07/2020	06:00	07:00	23
17/07/2020	07:00	08:00	31
17/07/2020	08:00	09:00	36
17/07/2020	09:00	10:00	38
17/07/2020	10:00	11:00	27
17/07/2020	11:00	12:00	41
17/07/2020	12:00	13:00	23
17/07/2020	13:00	14:00	18
17/07/2020	14:00	15:00	20
17/07/2020	15:00	16:00	27
17/07/2020	16:00	17:00	14
17/07/2020	17:00	18:00	16
17/07/2020	18:00	19:00	19
17/07/2020	19:00	20:00	19
17/07/2020	20:00	21:00	18
17/07/2020	21:00	22:00	18
17/07/2020	22:00	23:00	16
17/07/2020	23:00	00:00	11
18/07/2020	00:00	01:00	12

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
18/07/2020	01:00	02:00	8
18/07/2020	02:00	03:00	9
18/07/2020	03:00	04:00	11
18/07/2020	04:00	05:00	16
18/07/2020	05:00	06:00	18
18/07/2020	06:00	07:00	34
18/07/2020	07:00	08:00	39
18/07/2020	08:00	09:00	41
18/07/2020	09:00	10:00	39

LOCATION 4

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
18/07/2020	11:00	12:00	27
18/07/2020	12:00	13:00	17
18/07/2020	13:00	14:00	17
18/07/2020	14:00	15:00	24
18/07/2020	15:00	16:00	21
18/07/2020	16:00	17:00	20
18/07/2020	17:00	18:00	33
18/07/2020	18:00	19:00	26
18/07/2020	19:00	20:00	24
18/07/2020	20:00	21:00	19
18/07/2020	21:00	22:00	12
18/07/2020	22:00	23:00	12

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
18/07/2020	23:00	00:00	11
19/07/2020	00:00	01:00	11
19/07/2020	01:00	02:00	
19/07/2020	02:00	03:00	
19/07/2020	03:00	04:00	10
19/07/2020	04:00	05:00	10
19/07/2020	05:00	06:00	12
19/07/2020	06:00	07:00	29
19/07/2020	07:00	08:00	13
19/07/2020	08:00	09:00	21
19/07/2020	09:00	10:00	25
19/07/2020	10:00	11:00	26
19/07/2020	11:00	12:00	34
19/07/2020	12:00	13:00	28
19/07/2020	13:00	14:00	20
19/07/2020	14:00	15:00	26
19/07/2020	15:00	16:00	26
19/07/2020	16:00	17:00	18
19/07/2020	17:00	18:00	28
19/07/2020	18:00	19:00	30
19/07/2020	19:00	20:00	26
19/07/2020	20:00	21:00	20
19/07/2020	21:00	22:00	22
19/07/2020	22:00	23:00	15
19/07/2020	23:00	00:00	11

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
20/07/2020	00:00	01:00	11
20/07/2020	01:00	02:00	10
20/07/2020	02:00	03:00	9
20/07/2020	03:00	04:00	5
20/07/2020	04:00	05:00	5
20/07/2020	05:00	06:00	6
20/07/2020	06:00	07:00	11
20/07/2020	07:00	08:00	17
20/07/2020	08:00	09:00	13
20/07/2020	09:00	10:00	24
20/07/2020	10:00	11:00	15
20/07/2020	11:00	12:00	18
20/07/2020	12:00	13:00	21
20/07/2020	13:00	14:00	16
20/07/2020	14:00	15:00	14
20/07/2020	15:00	16:00	19
20/07/2020	16:00	17:00	14
20/07/2020	17:00	18:00	22
20/07/2020	18:00	19:00	46
20/07/2020	19:00	20:00	18
20/07/2020	20:00	21:00	21
20/07/2020	21:00	22:00	44
20/07/2020	22:00	23:00	12
20/07/2020	23:00	00:00	13
21/07/2020	00:00	01:00	13

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
21/07/2020	01:00	02:00	11
21/07/2020	02:00	03:00	9
21/07/2020	03:00	04:00	6
21/07/2020	04:00	05:00	6
21/07/2020	05:00	06:00	8
21/07/2020	06:00	07:00	9
21/07/2020	07:00	08:00	12
21/07/2020	08:00	09:00	16
21/07/2020	09:00	10:00	8
21/07/2020	10:00	11:00	17
21/07/2020	11:00	12:00	13
21/07/2020	12:00	13:00	15
21/07/2020	13:00	14:00	10
21/07/2020	14:00	15:00	11
21/07/2020	15:00	16:00	10
21/07/2020	16:00	17:00	7
21/07/2020	17:00	18:00	8
21/07/2020	18:00	19:00	10
21/07/2020	19:00	20:00	19
21/07/2020	20:00	21:00	14
21/07/2020	21:00	22:00	25
21/07/2020	22:00	23:00	10
21/07/2020	23:00	00:00	10
22/07/2020	00:00	01:00	8
22/07/2020	01:00	02:00	5

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
22/07/2020	02:00	03:00	5
22/07/2020	03:00	04:00	7
22/07/2020	04:00	05:00	7
22/07/2020	05:00	06:00	6
22/07/2020	06:00	07:00	6
22/07/2020	07:00	08:00	7
22/07/2020	08:00	09:00	9
22/07/2020	09:00	10:00	12
22/07/2020	10:00	11:00	20
22/07/2020	11:00	12:00	19
22/07/2020	12:00	13:00	15
22/07/2020	13:00	14:00	15
22/07/2020	14:00	15:00	14
22/07/2020	15:00	16:00	20
22/07/2020	16:00	17:00	16
22/07/2020	17:00	18:00	24
22/07/2020	18:00	19:00	21
22/07/2020	19:00	20:00	26
22/07/2020	20:00	21:00	23
22/07/2020	21:00	22:00	11
22/07/2020	22:00	23:00	15
22/07/2020	23:00	00:00	10
23/07/2020	00:00	01:00	8
23/07/2020	01:00	02:00	7
23/07/2020	02:00	03:00	9

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
23/07/2020	03:00	04:00	7
23/07/2020	04:00	05:00	6
23/07/2020	05:00	06:00	5
23/07/2020	06:00	07:00	11
23/07/2020	07:00	08:00	14
23/07/2020	08:00	09:00	17
23/07/2020	09:00	10:00	22
23/07/2020	10:00	11:00	20
23/07/2020	11:00	12:00	36
23/07/2020	12:00	13:00	27
23/07/2020	13:00	14:00	28
23/07/2020	14:00	15:00	21
23/07/2020	15:00	16:00	26
23/07/2020	16:00	17:00	29
23/07/2020	17:00	18:00	29
23/07/2020	18:00	19:00	25
23/07/2020	19:00	20:00	25
23/07/2020	20:00	21:00	30
23/07/2020	21:00	22:00	26
23/07/2020	22:00	23:00	21
23/07/2020	23:00	00:00	21
24/07/2020	00:00	01:00	17
24/07/2020	01:00	02:00	19
24/07/2020	02:00	03:00	19
24/07/2020	03:00	04:00	14

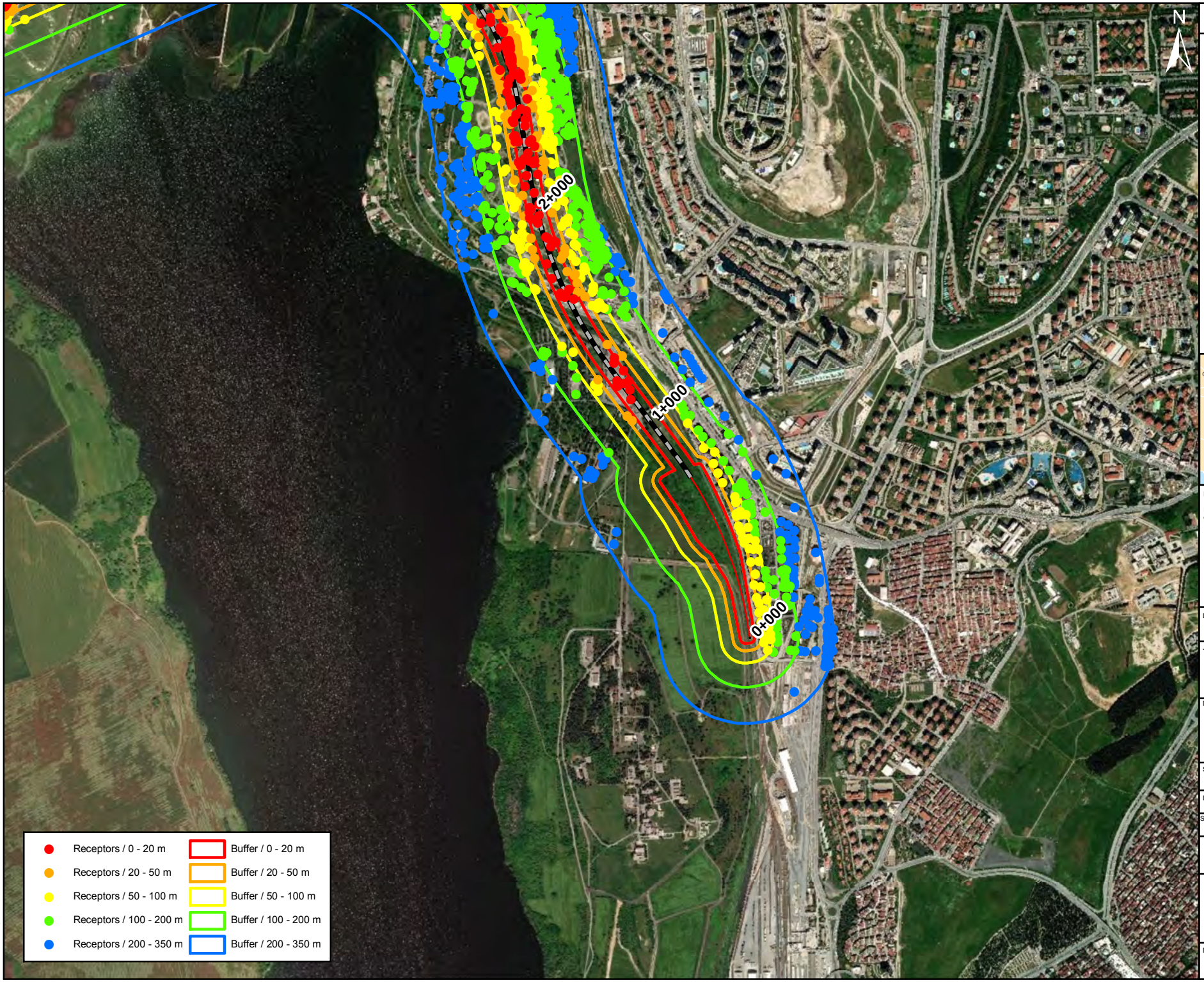
Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
24/07/2020	04:00	05:00	14
24/07/2020	05:00	06:00	11
24/07/2020	06:00	07:00	10
24/07/2020	07:00	08:00	16
24/07/2020	08:00	09:00	18
24/07/2020	09:00	10:00	88
24/07/2020	10:00	11:00	63
24/07/2020	11:00	12:00	48
24/07/2020	12:00	13:00	51
24/07/2020	13:00	14:00	48
24/07/2020	14:00	15:00	40
24/07/2020	15:00	16:00	48
24/07/2020	16:00	17:00	39
24/07/2020	17:00	18:00	34
24/07/2020	18:00	19:00	44
24/07/2020	19:00	20:00	23
24/07/2020	20:00	21:00	18
24/07/2020	21:00	22:00	25
24/07/2020	22:00	23:00	23
24/07/2020	23:00	00:00	20
25/07/2020	00:00	01:00	21
25/07/2020	01:00	02:00	31
25/07/2020	02:00	03:00	39
25/07/2020	03:00	04:00	36
25/07/2020	04:00	05:00	41

Measurement Date	Start Time	End Time	PM_{10} Concentration ($\mu g/m^3$)
25/07/2020	05:00	06:00	20
25/07/2020	06:00	07:00	25
25/07/2020	07:00	08:00	21
25/07/2020	08:00	09:00	26
25/07/2020	09:00	10:00	24
25/07/2020	10:00	11:00	34
25/07/2020	11:00	12:00	36

Notes for *: In general, any error which prevents the BAM 1020 from making a valid, hourly concentration measurement will also cause the digital concentration value to be stored as a full-scale value (usually 0.985 mg) in order to indicate invalid data. In most cases, critical errors will also force the analogue output to full-scale.

Appendix H

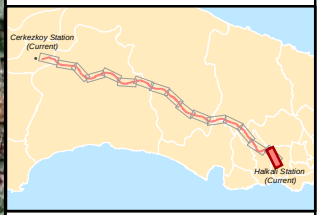
AIR QUALITY FIGURES (CHAPTER 6: AIR QUALITY)



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Tunnel (TBM - Double Tube)



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-1 - Construction Dust and Affected Receptors

Scale at A4

1:20,000

Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
AD	JW	DG	02/03/2021

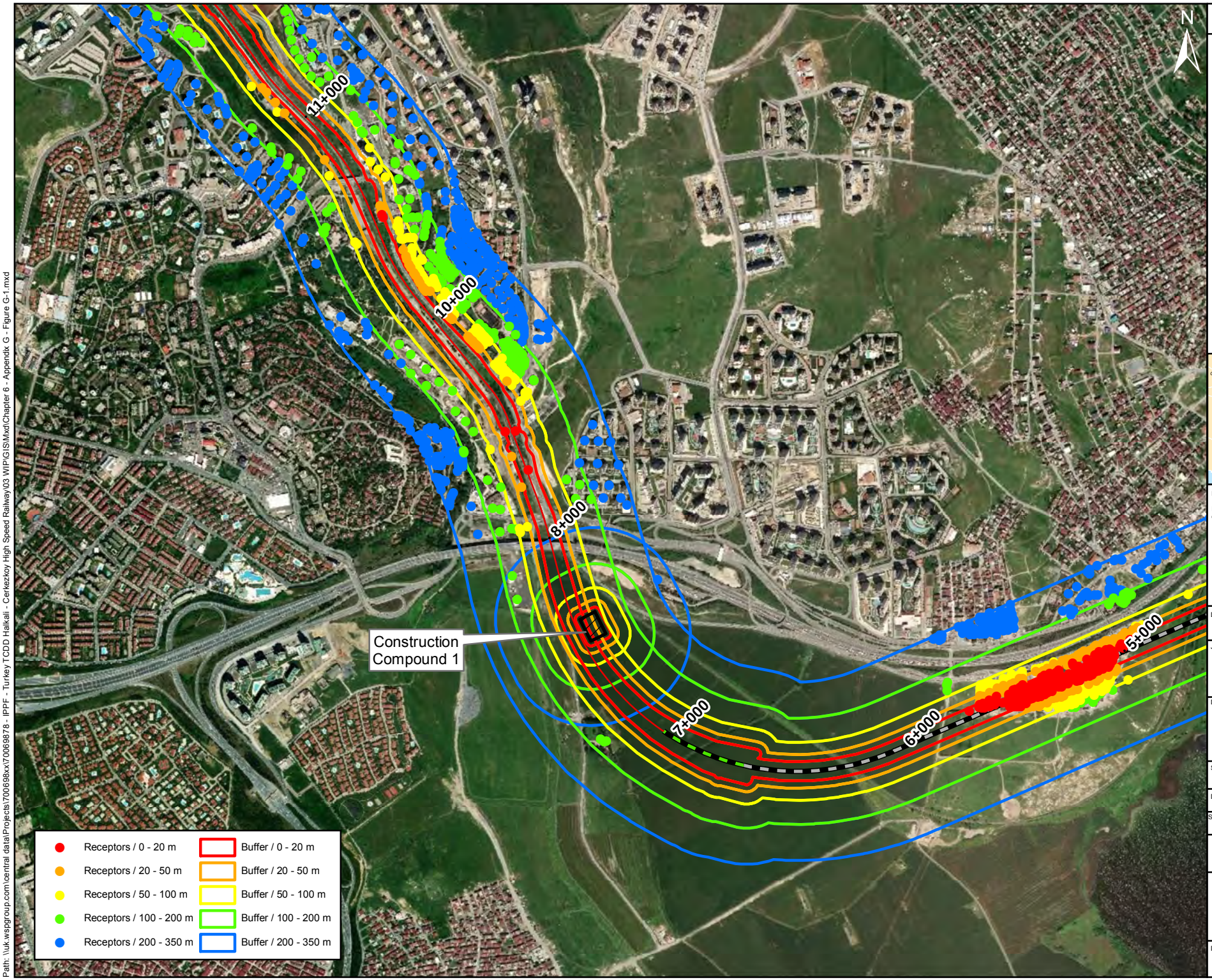
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m

Drawing Number

Figure G-1 (1 / 17)

Path: \\uk.wspgroup.com\central data\Projects\700698xx\700698878 - IPPF - Turkey TCDD Halkali - Cerkezkoy High Speed Railway\03 WIP\GIS\Mxd\Chapter 6 - Appendix G - Figure G-1.mxd



N

THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Tunnel (TBM - Double Tube)
- Tunnel (Cut - Cover)
- Possible Construction Compounds



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status: FINAL

Job Title: HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title: Figure 6-1 - Construction Dust and Affected Receptors

Scale at A4: 1:20,000

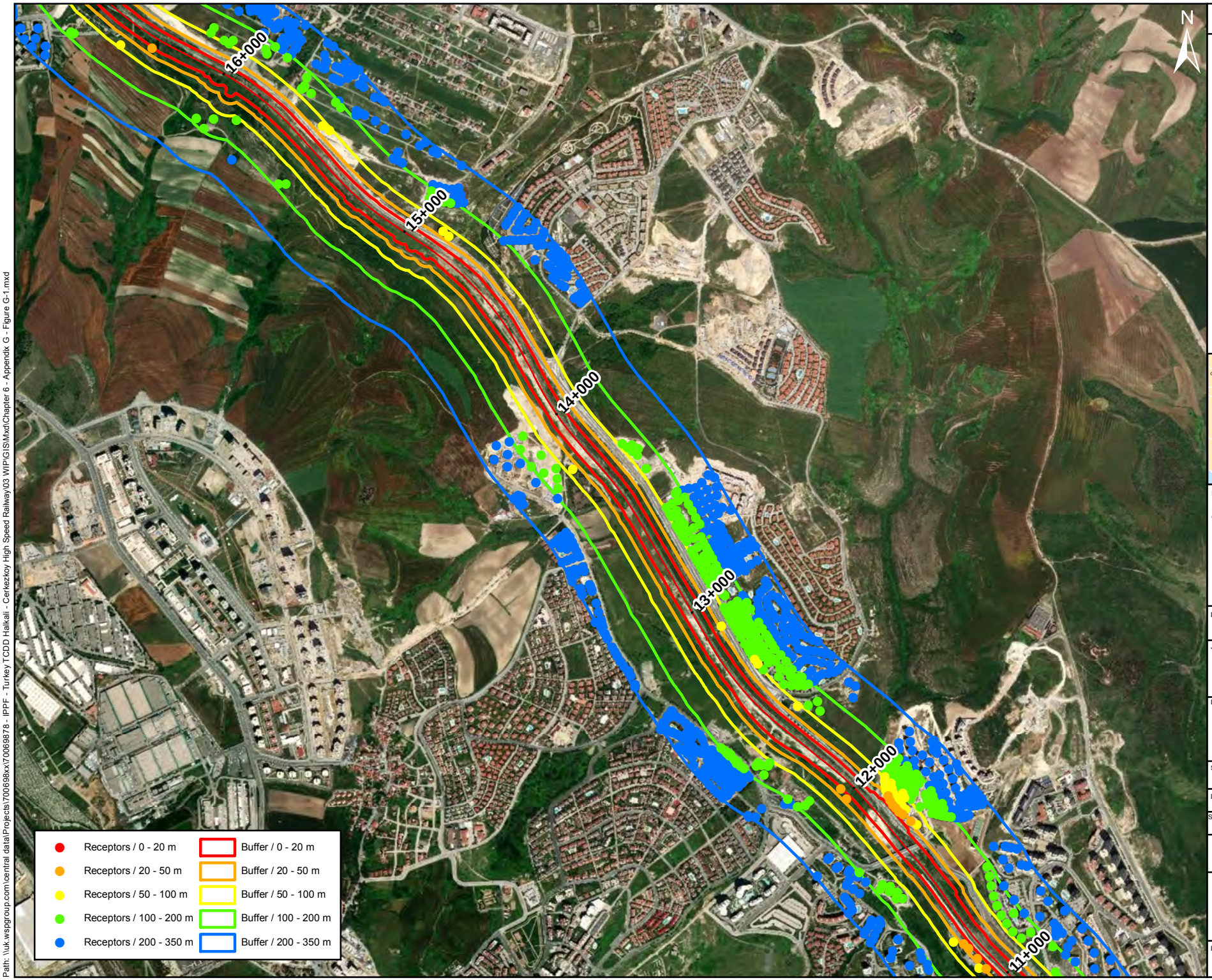
Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
AD	JW	DG	02/03/2021

0 80 160 320 480 640 m

wsp

Drawing Number: Figure G-1 (2 / 17)

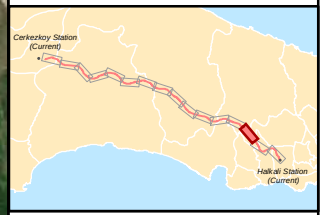
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Legend

Proposed Railway Route



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-1 - Construction Dust and Affected Receptors

Scale at A4

1:20,000

Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
AD	JW	DG	02/03/2021

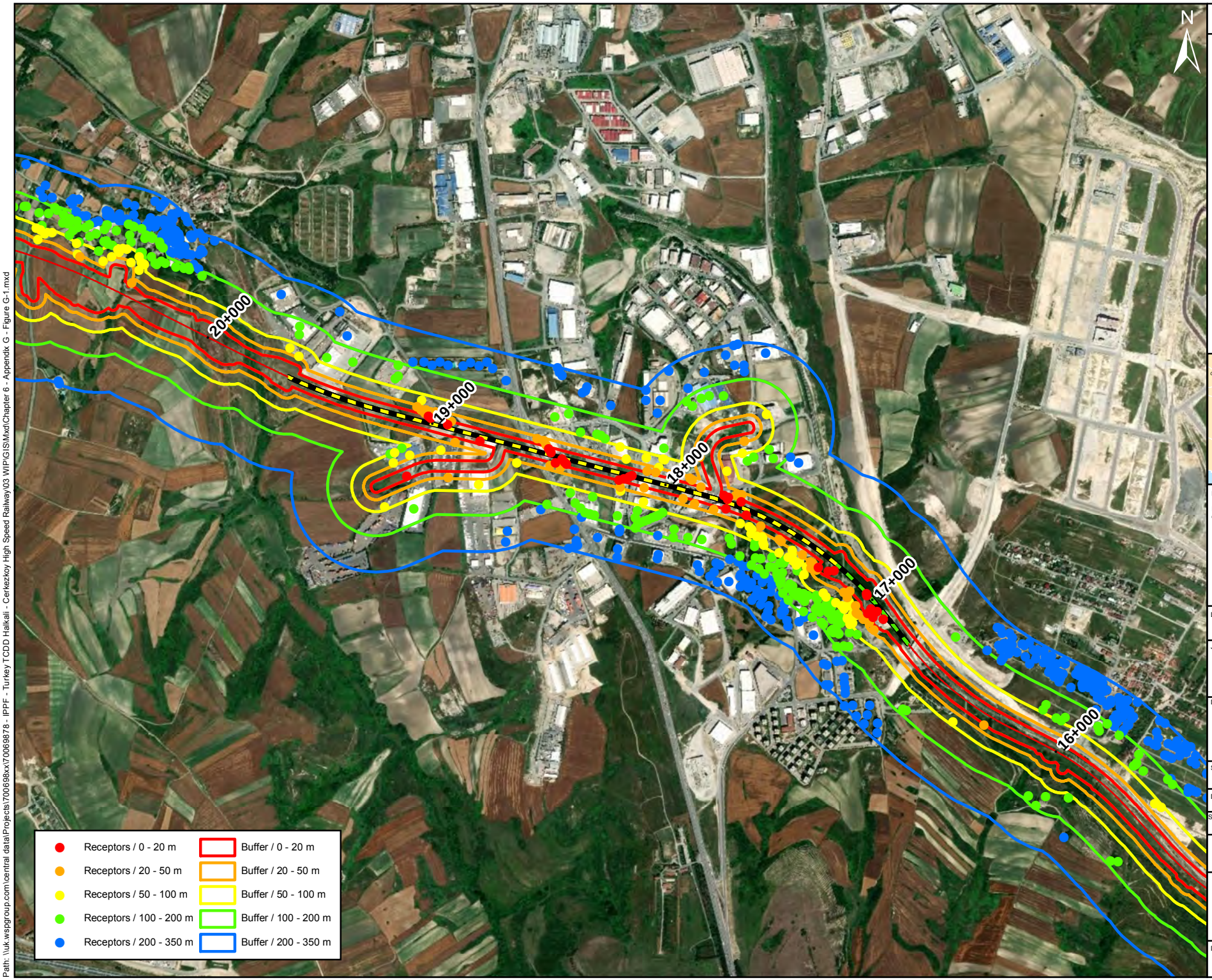
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m

Drawing Number

Figure G-1 (3 / 17)

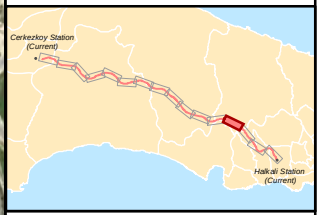
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Tunnel (NATM)
- Tunnel (Cut - Cover)



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-1 - Construction Dust and Affected Receptors

Scale at A4

1:20,000

Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
AD	JW	DG	02/03/2021

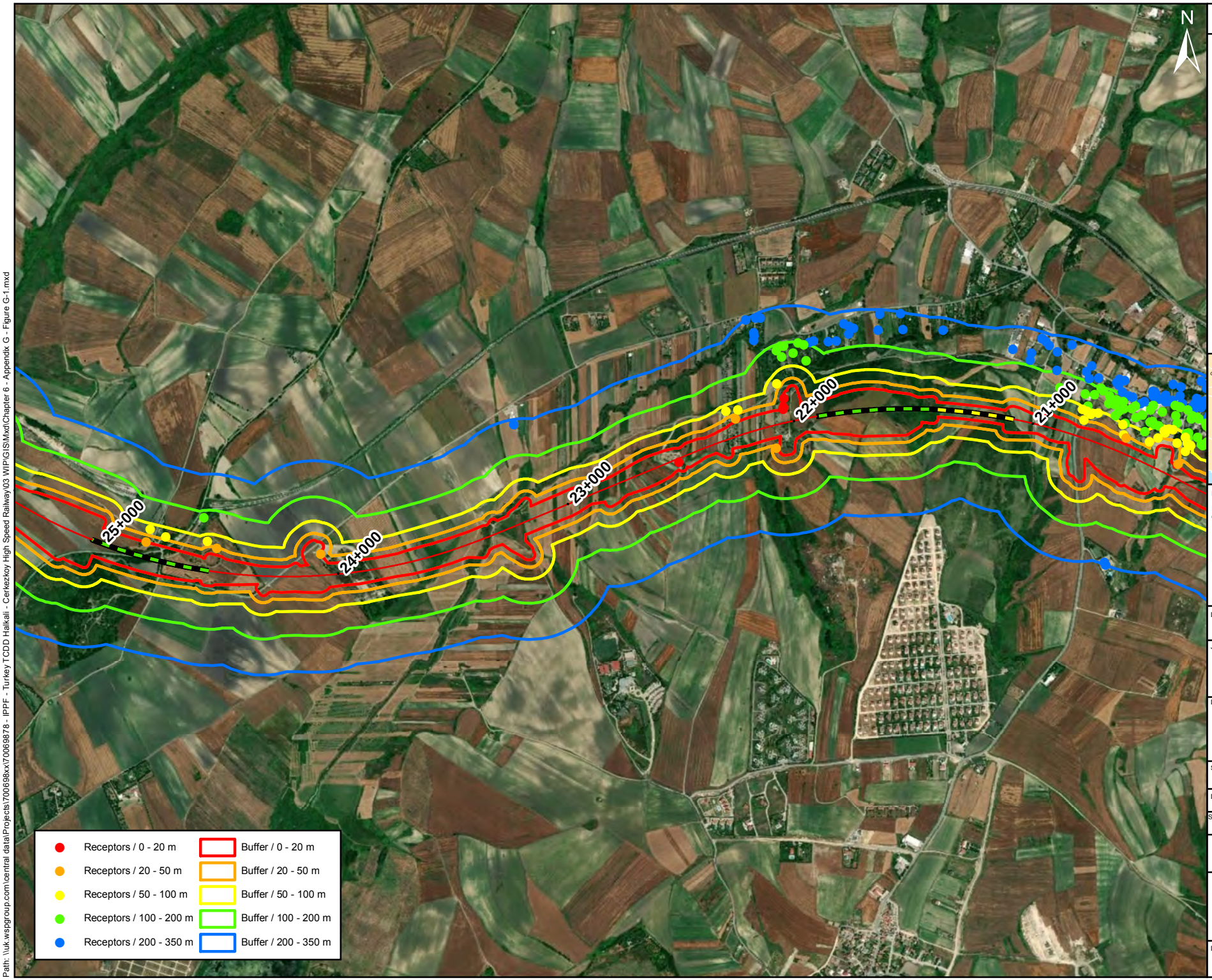
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m

Drawing Number

Figure G-1 (4 / 17)

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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Tunnel (NATM)
- Tunnel (Cut - Cover)



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-1 - Construction Dust and Affected Receptors

Scale at A4

1:20,000

Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
AD	JW	DG	02/03/2021

0 80 160 320 480 640

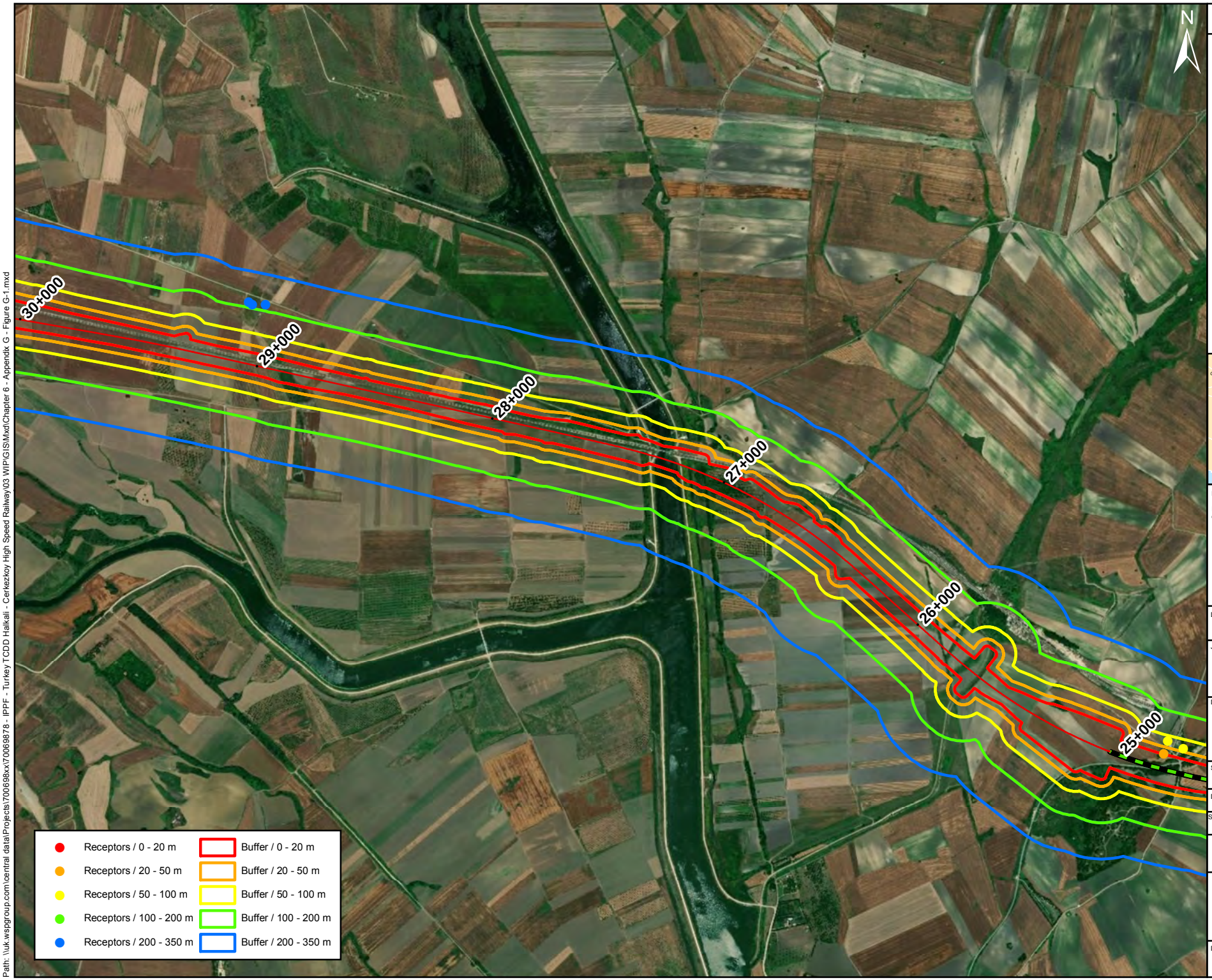
m

wsp

Drawing Number

Figure G-1 (5 / 17)

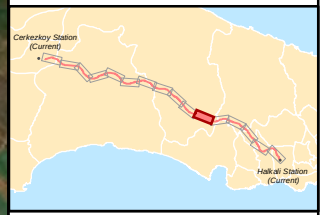
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Tunnel (Cut - Cover)



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-1 - Construction Dust and Affected Receptors

Scale at A4

1:20,000

Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
AD	JW	DG	02/03/2021

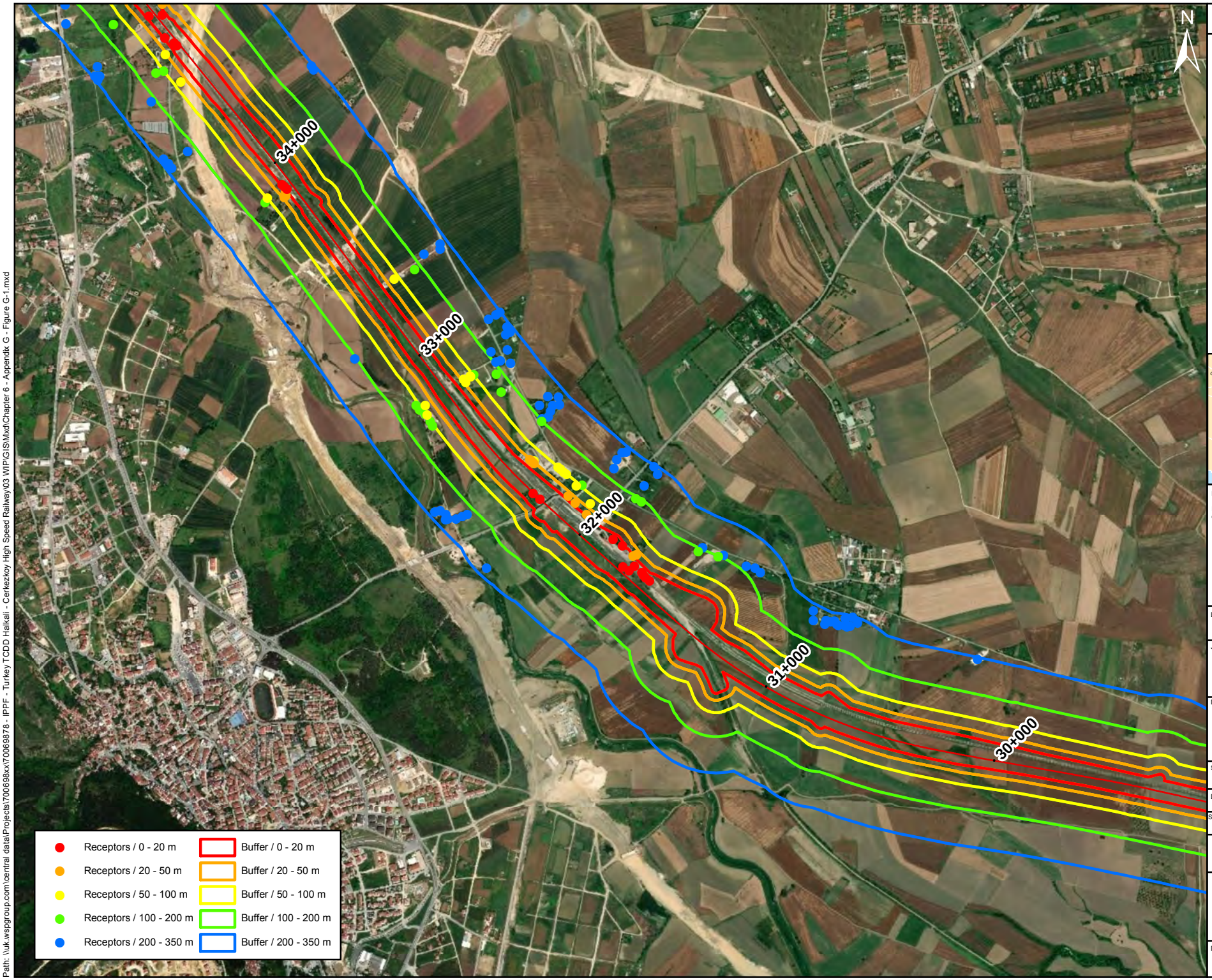
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m

Drawing Number

Figure G-1 (6 / 17)

Path: \\uk.wspgroup.com\central data\Projects\70069878xx\70069878 - IPPF - Turkey TCDD Halkali - Cerkezkoy High Speed Railway\03 WIP\GIS\Mxd\Chapter 6 - Appendix G - Figure G-1.mxd



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

Proposed Railway Route



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-1 - Construction Dust and Affected Receptors

Scale at A4

1:20,000

Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
AD	JW	DG	02/03/2021

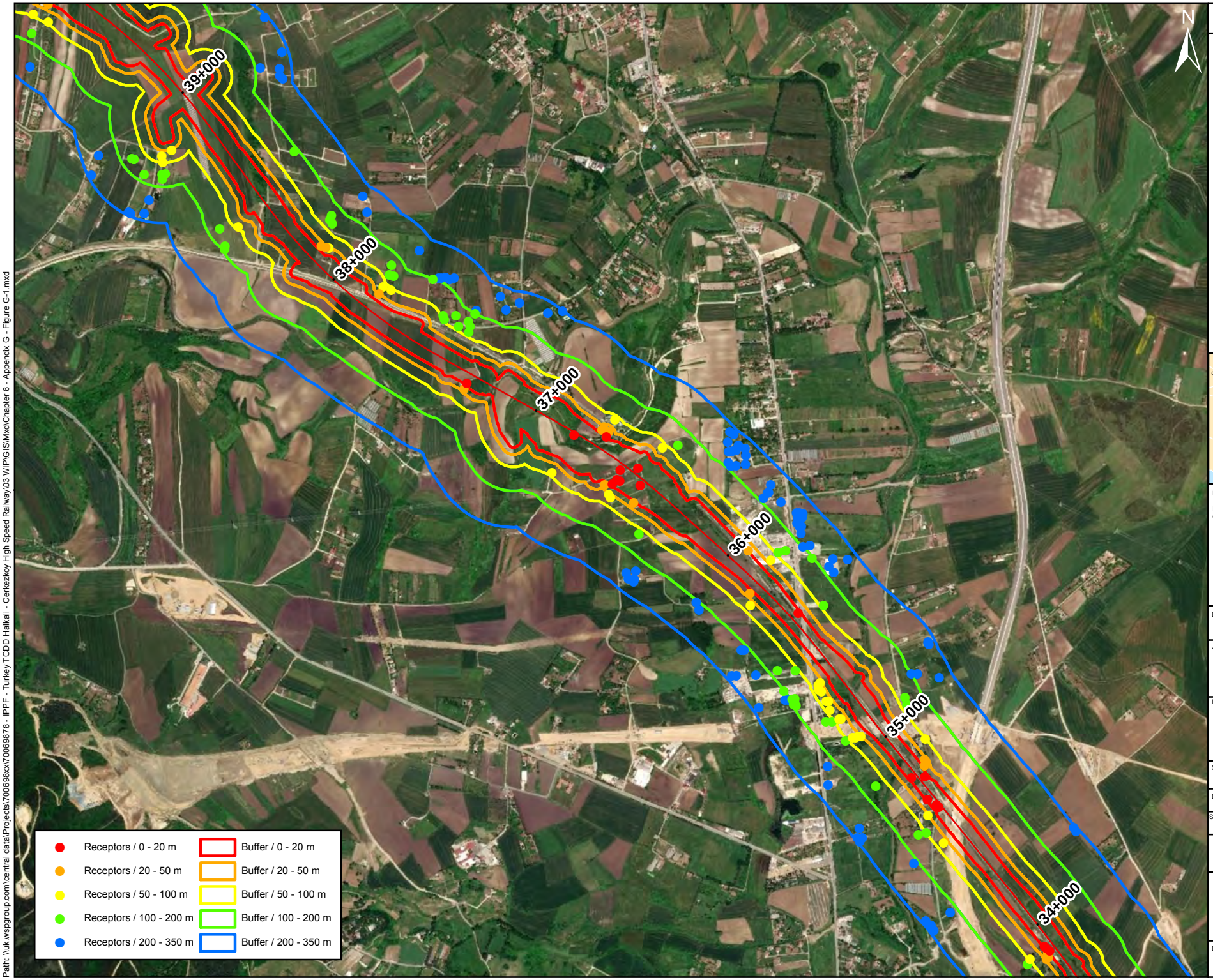
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m

Drawing Number

Figure G-1 (7 / 17)

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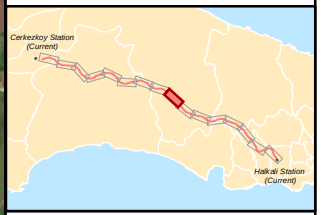


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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

Proposed Railway Route



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-1 - Construction Dust and Affected Receptors

Scale at A4

1:20,000

Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
AD	JW	DG	02/03/2021

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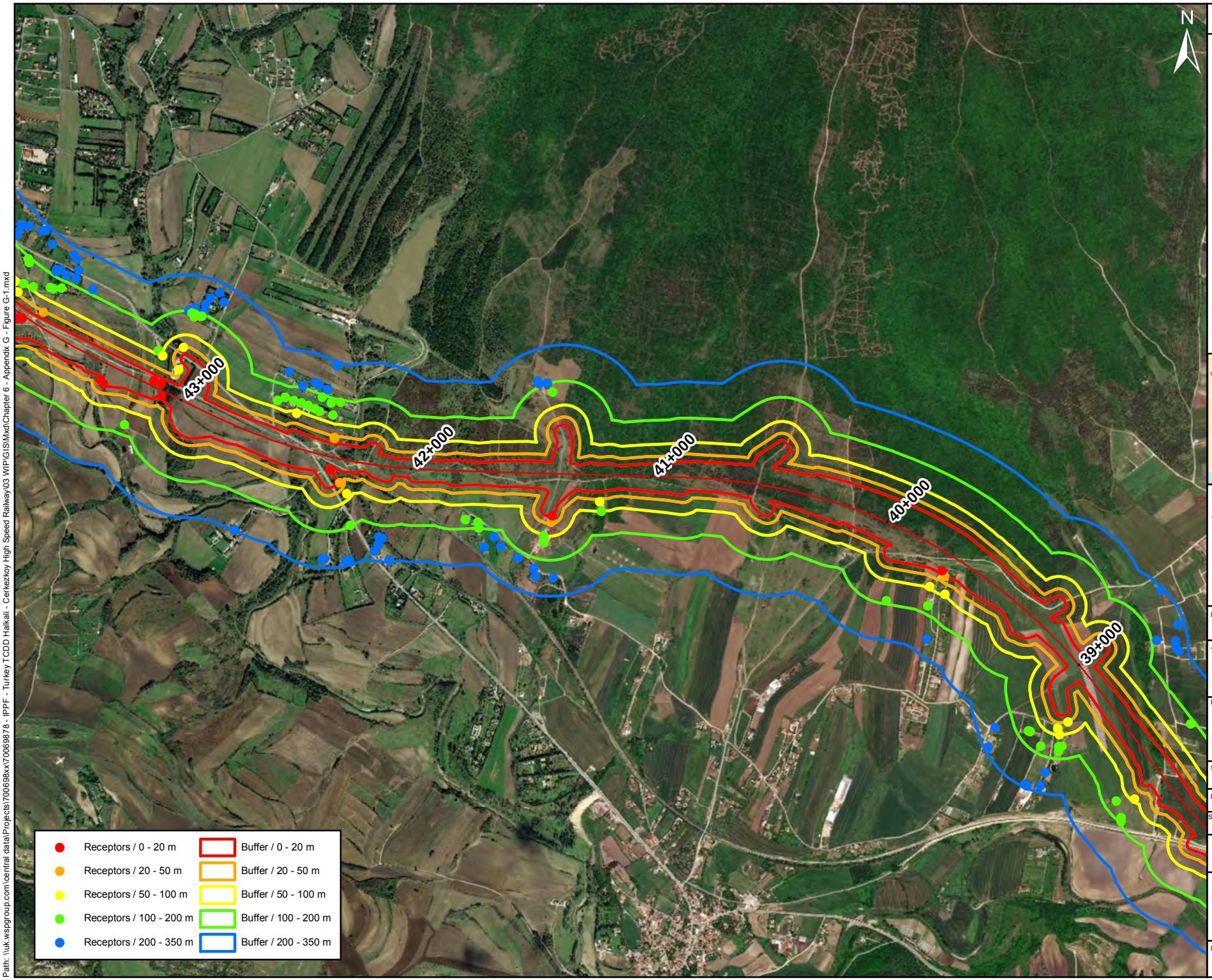
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Drawing Number

Figure G-1 (8 / 17)

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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

Proposed Railway Route



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-1 - Construction Dust and Affected Receptors

Scale at A4

1:20,000

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AD	JW	DG	02/03/2021

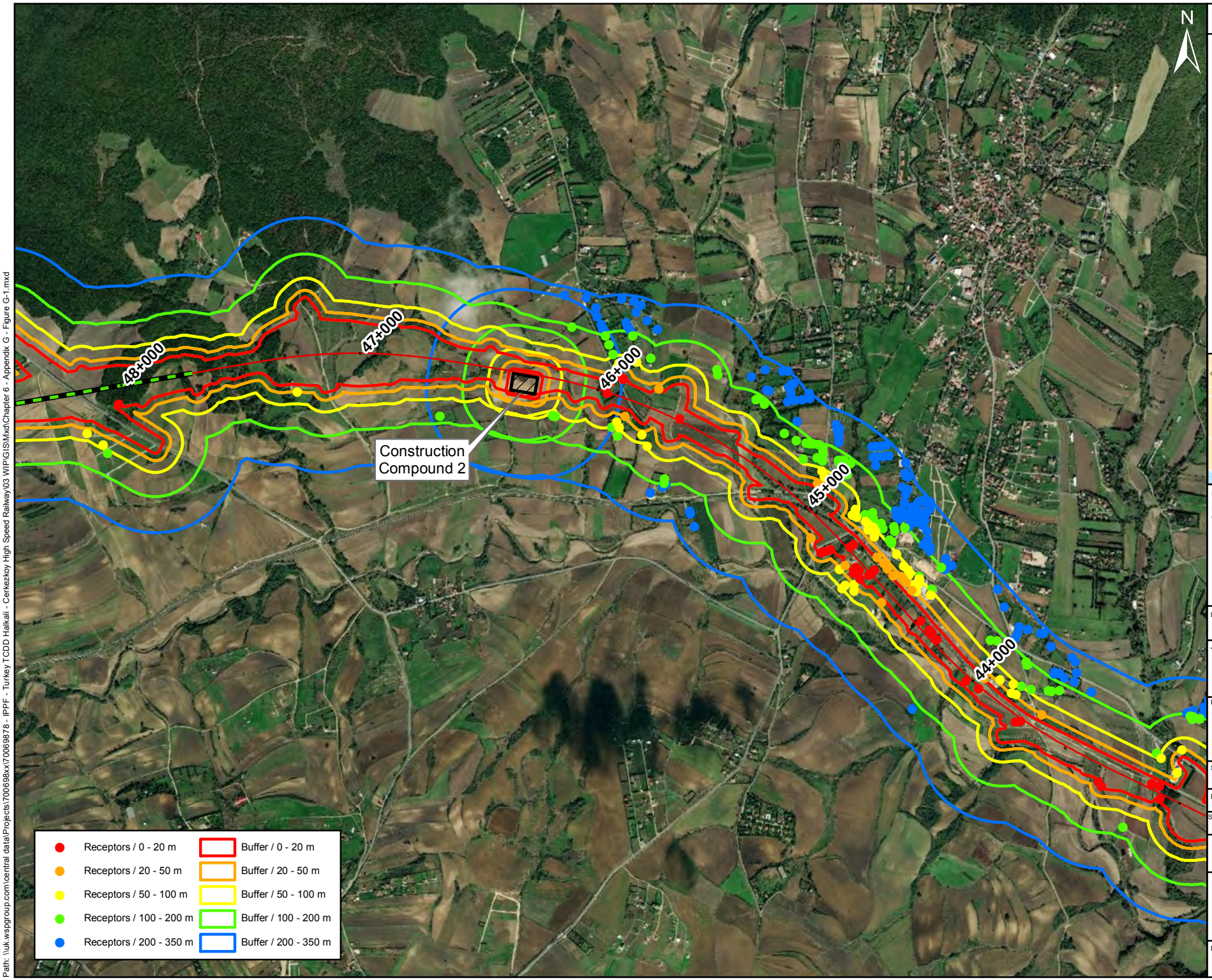
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Drawing Number

Figure G-1 (9 / 17)

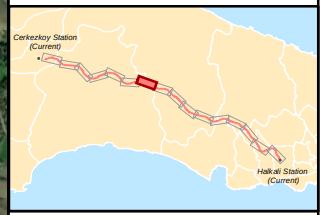
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Tunnel (Cut - Cover)
- Possible Construction Compounds



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status: FINAL

Job Title: HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title: Figure 6-1 - Construction Dust and Affected Receptors

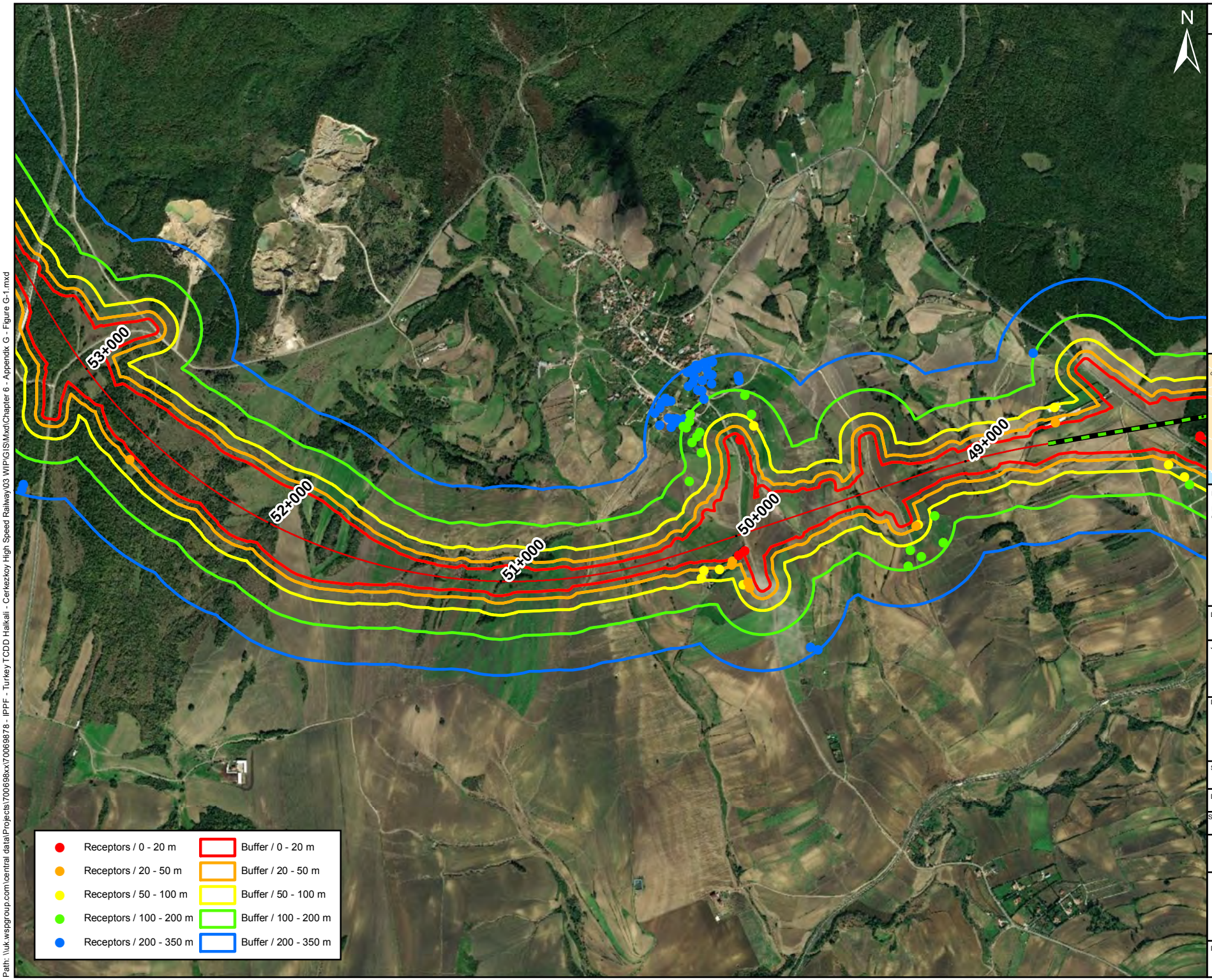
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AD	JW	DG	02/03/2021

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Drawing Number: Figure G-1 (10 / 17)

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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Tunnel (Cut - Cover)



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status: FINAL

Job Title: HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title: Figure 6-1 - Construction Dust and Affected Receptors

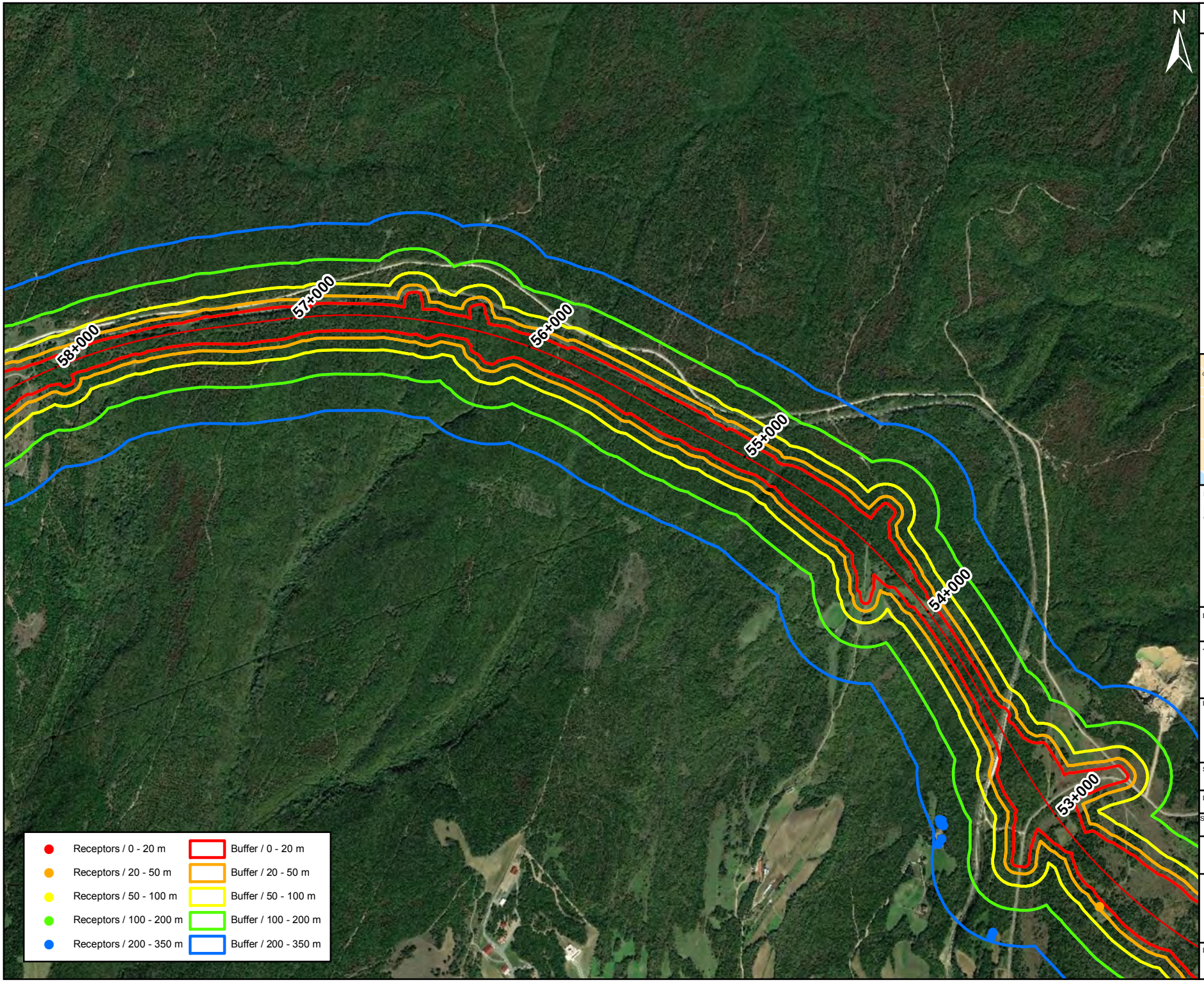
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AD	JW	DG	02/03/2021

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Drawing Number: Figure G-1 (11 / 17)

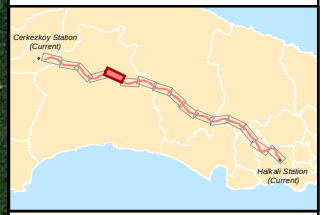
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

Proposed Railway Route



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-1 - Construction Dust and Affected Receptors

Scale at A4

1:20,000

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AD	JW	DG	02/03/2021

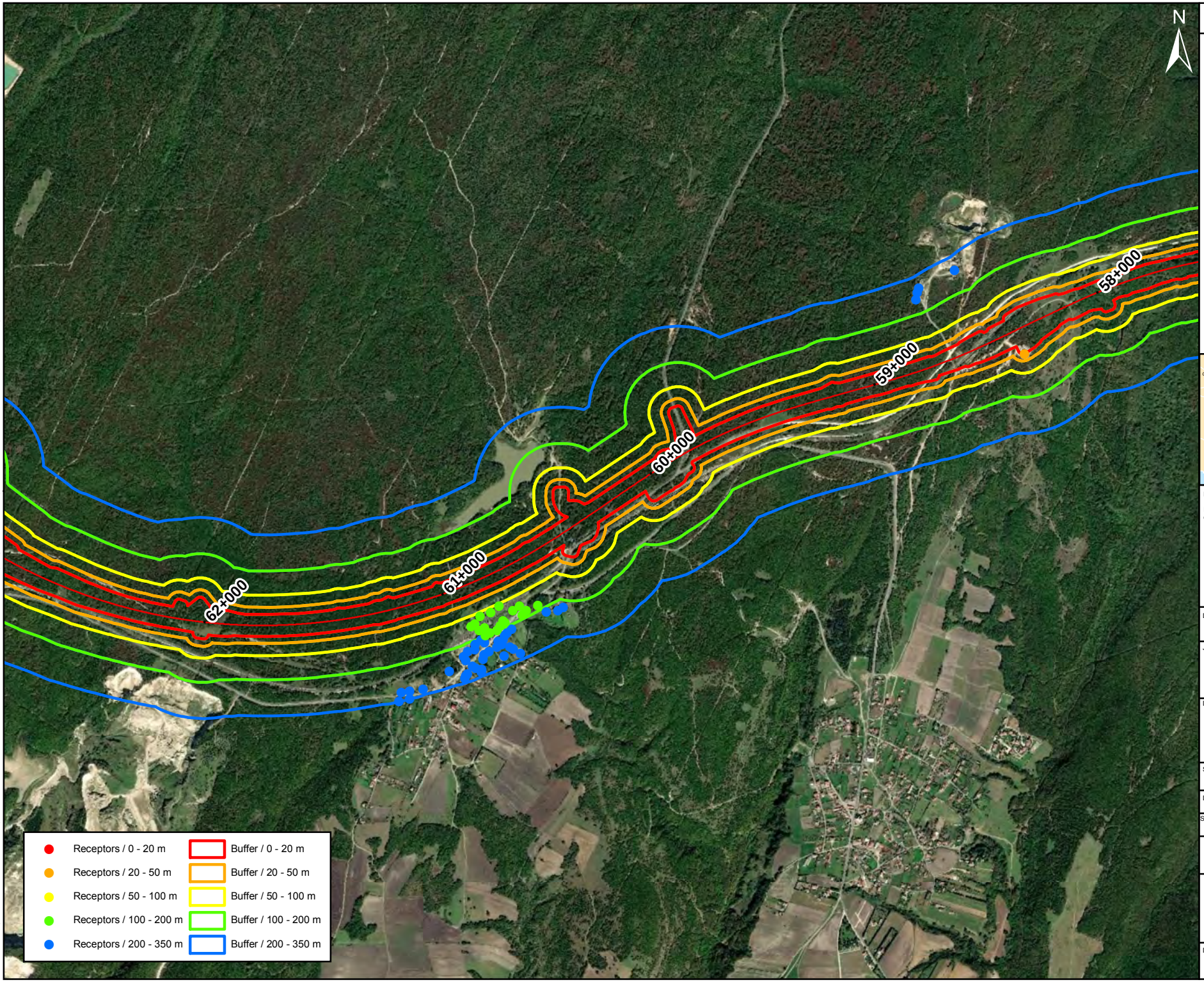
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Drawing Number

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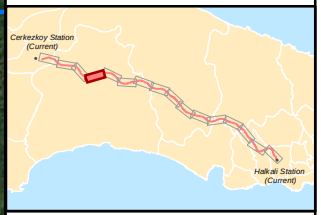


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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

Proposed Railway Route



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-1 - Construction Dust and Affected Receptors

Scale at A4

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AD	JW	DG	02/03/2021

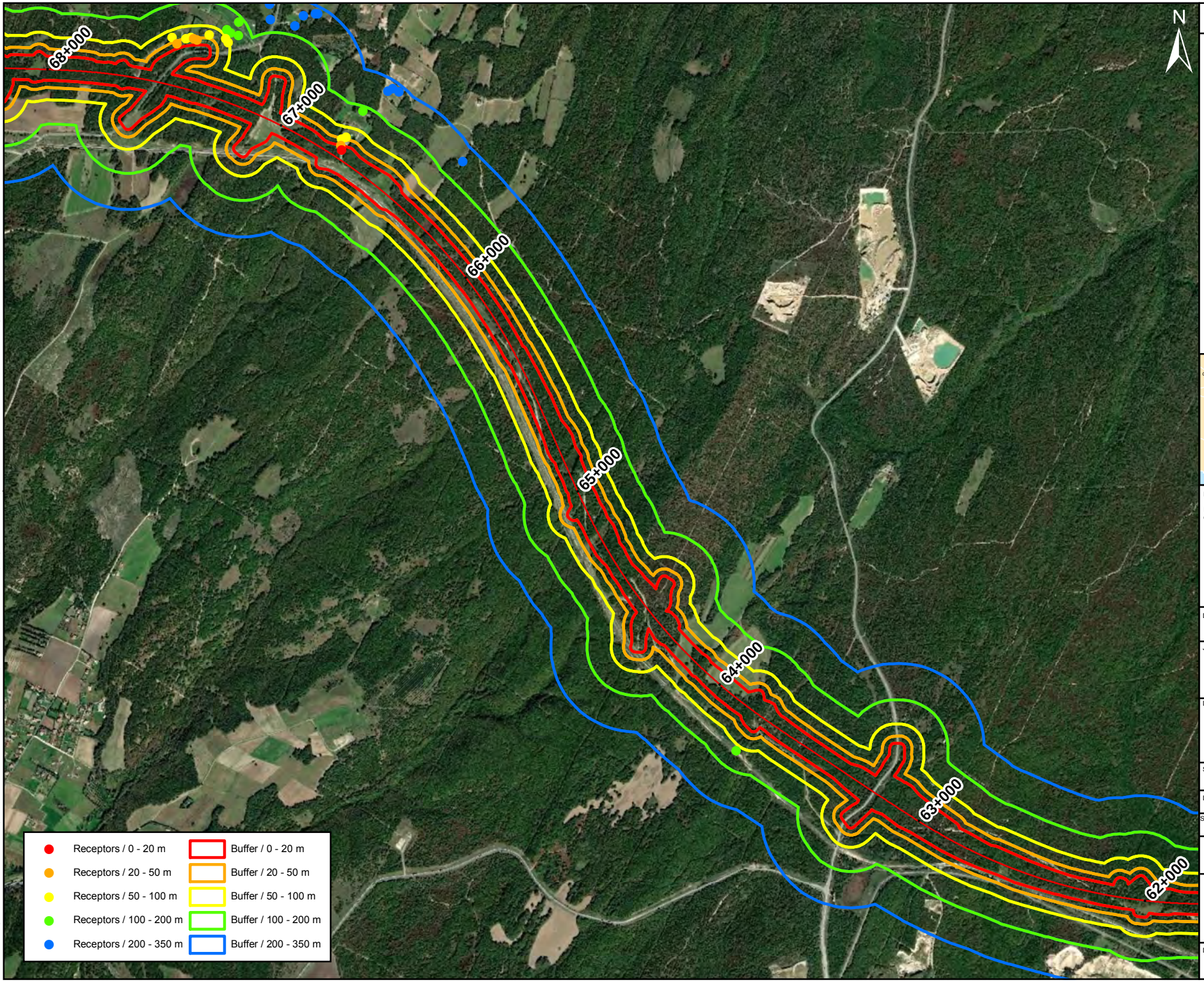
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wsp

Drawing Number

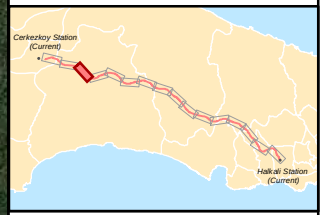
Figure G-1 (13 / 17)



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

Proposed Railway Route



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-1 - Construction Dust and Affected Receptors

Scale at A4

1:20,000

Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
AD	JW	DG	02/03/2021

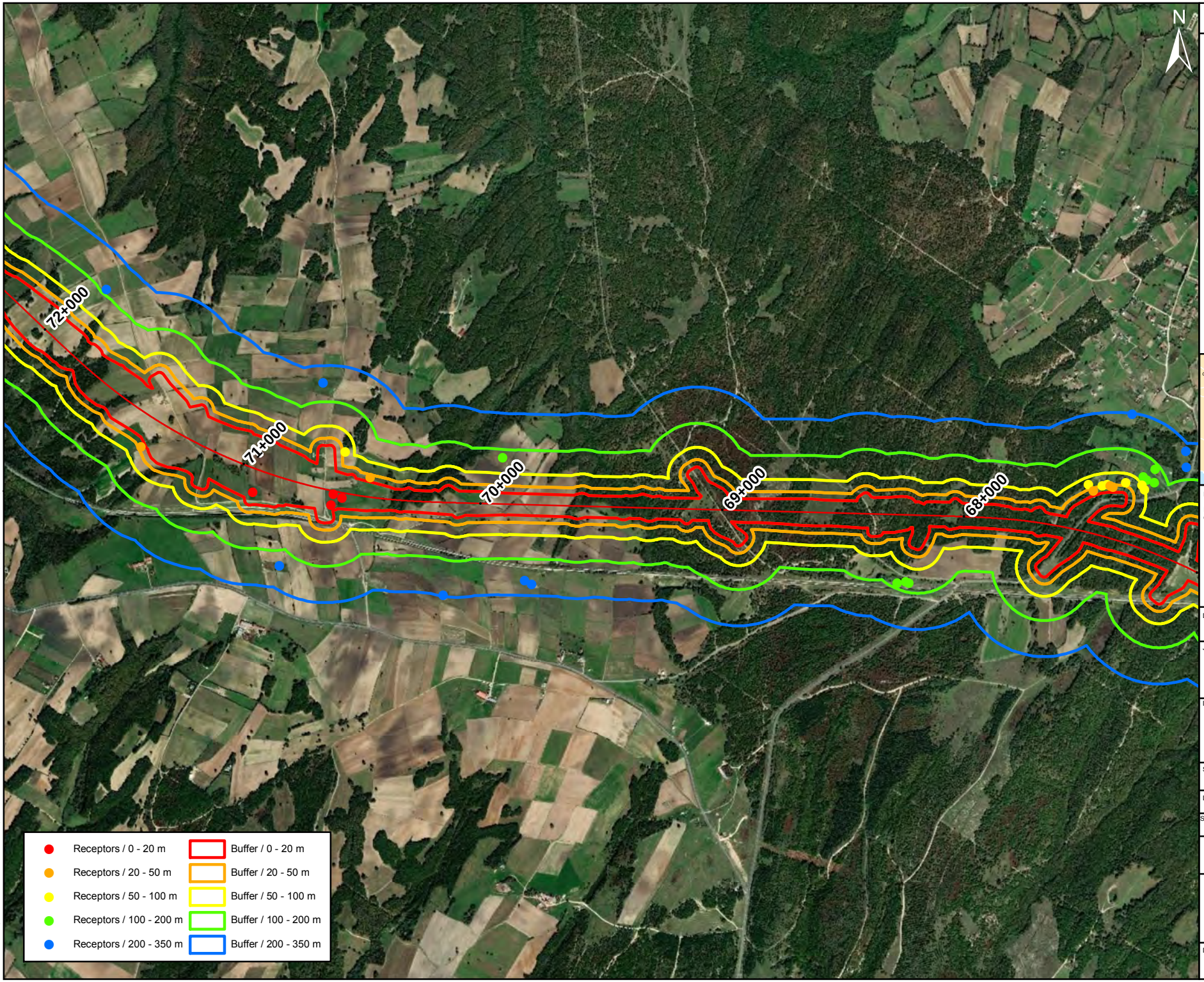
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Drawing Number

Figure G-1 (14 / 17)

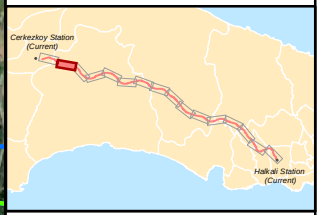
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Legend

Proposed Railway Route



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-1 - Construction Dust and Affected Receptors

Scale at A4

1:20,000

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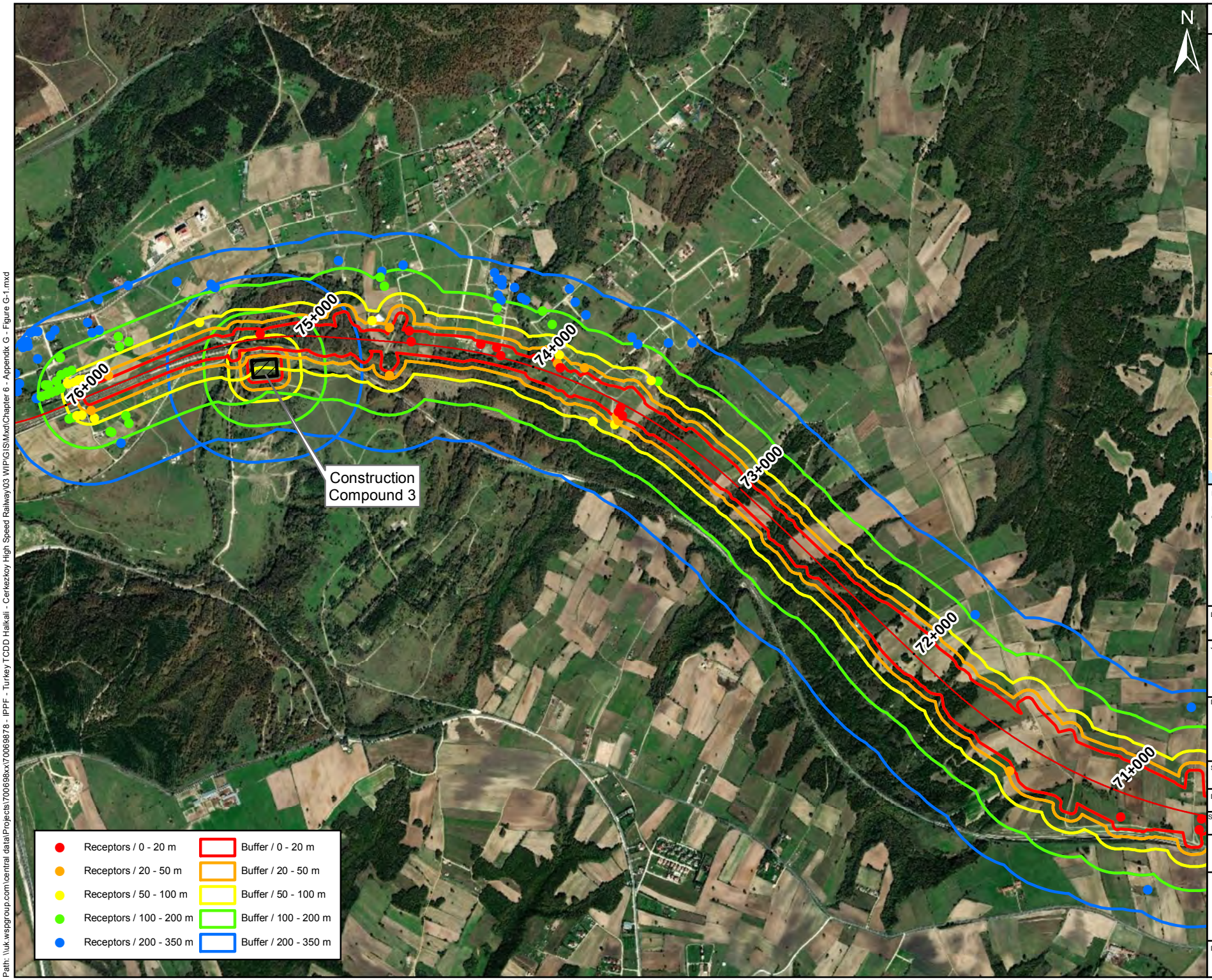
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Drawing Number

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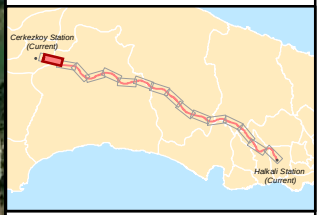
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Legend

- Proposed Railway Route
- Possible Construction Compounds



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status: FINAL

Job Title: HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title: Figure 6-1 - Construction Dust and Affected Receptors

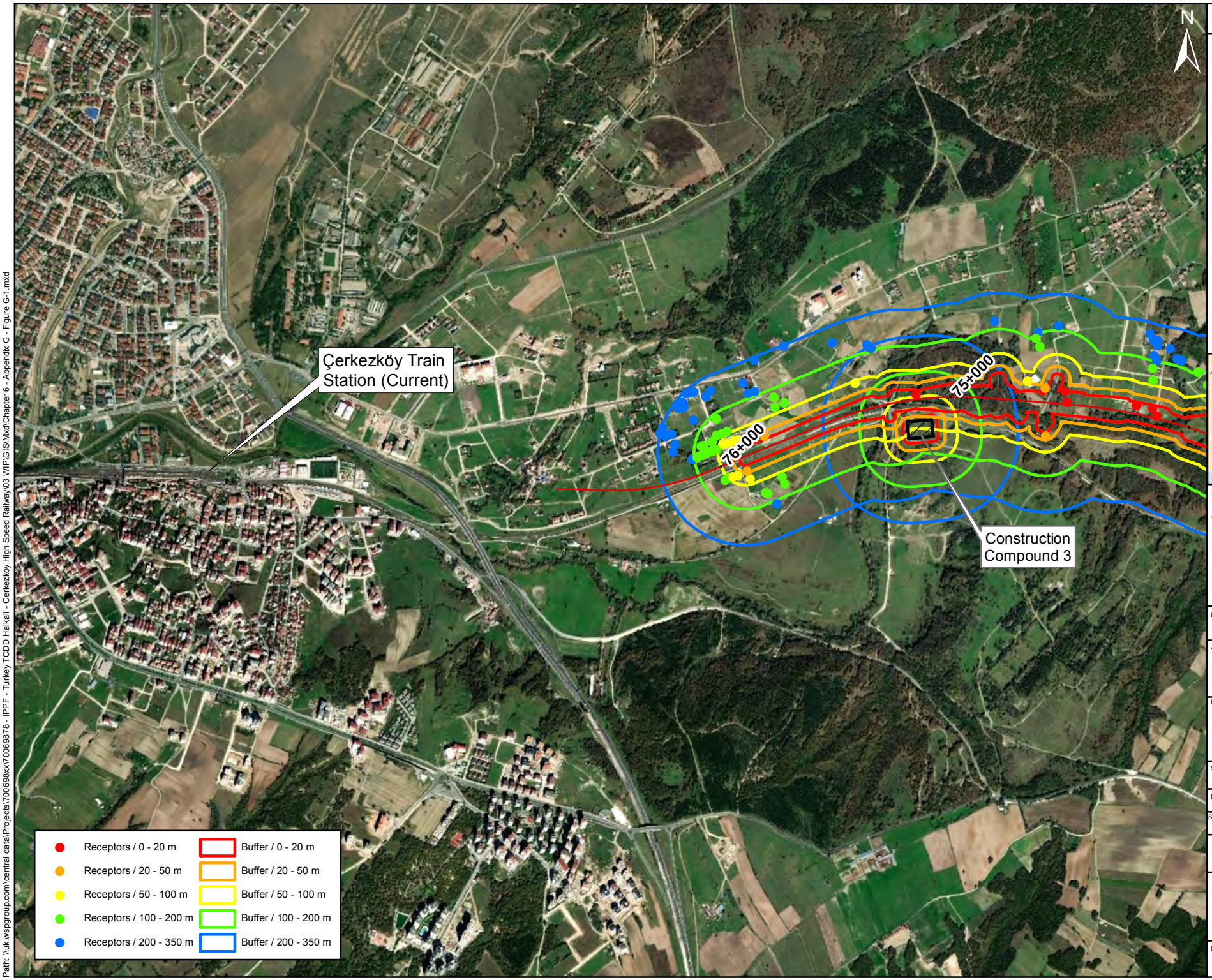
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AD	JW	DG	02/03/2021

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Drawing Number: Figure G-1 (16 / 17)

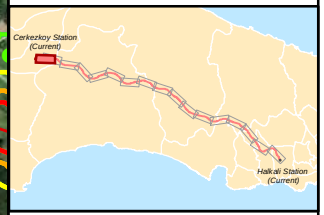
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Legend

- Proposed Railway Route
- Possible Construction Compounds



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status: FINAL

Job Title: HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title: Figure 6-1 - Construction Dust and Affected Receptors

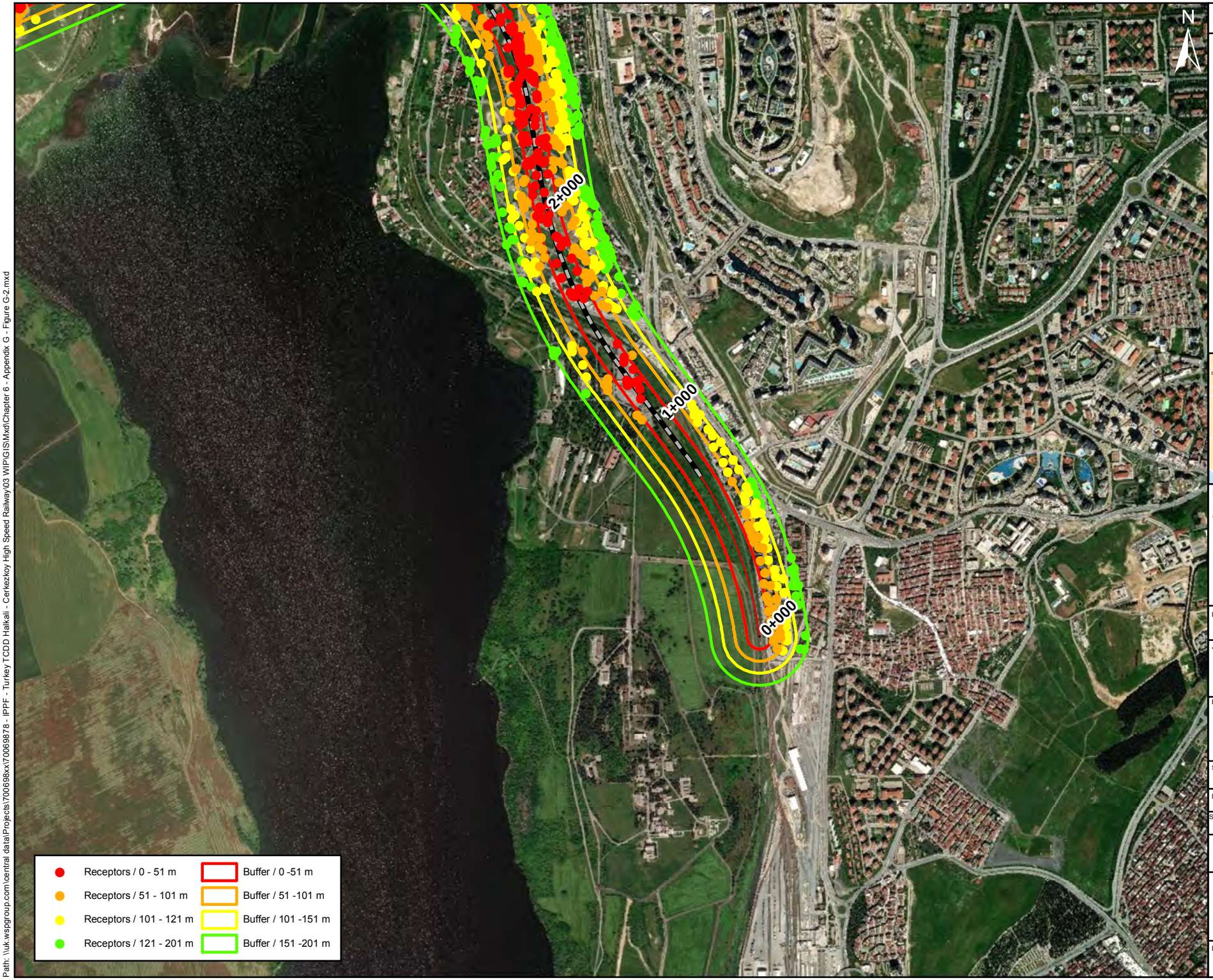
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Drawing Number: Figure G-1 (17 / 17)

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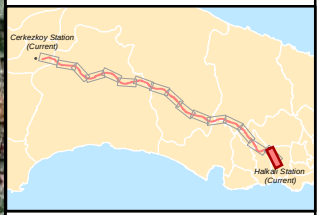
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Legend

Proposed Railway Route

Tunnel (TBM - Double Tube)



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

1:20,000

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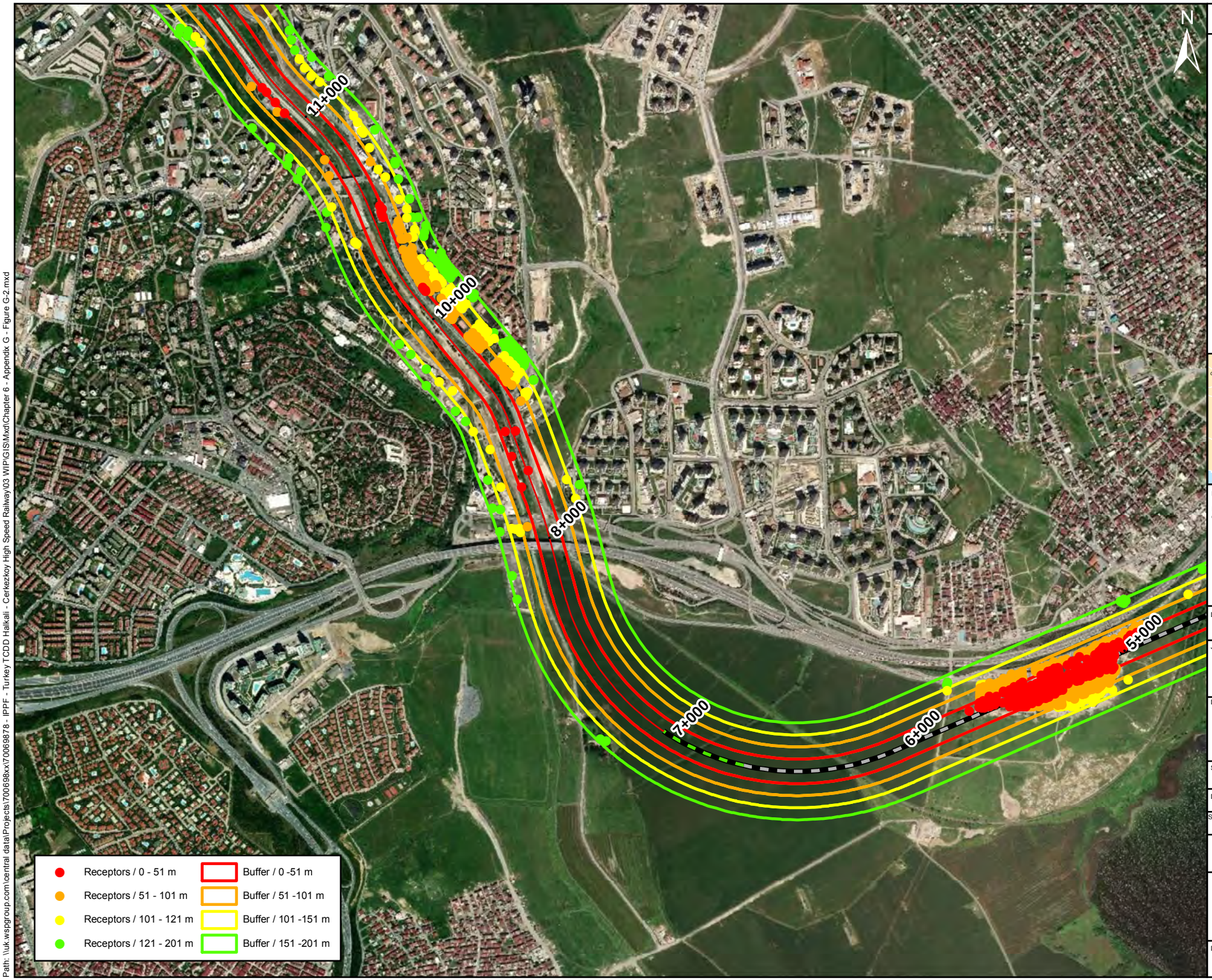
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Drawing Number

Figure 6-3 (1 / 17)

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Legend

- Proposed Railway Route
- Tunnel (TBM - Double Tube)
- Tunnel (Cut - Cover)



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

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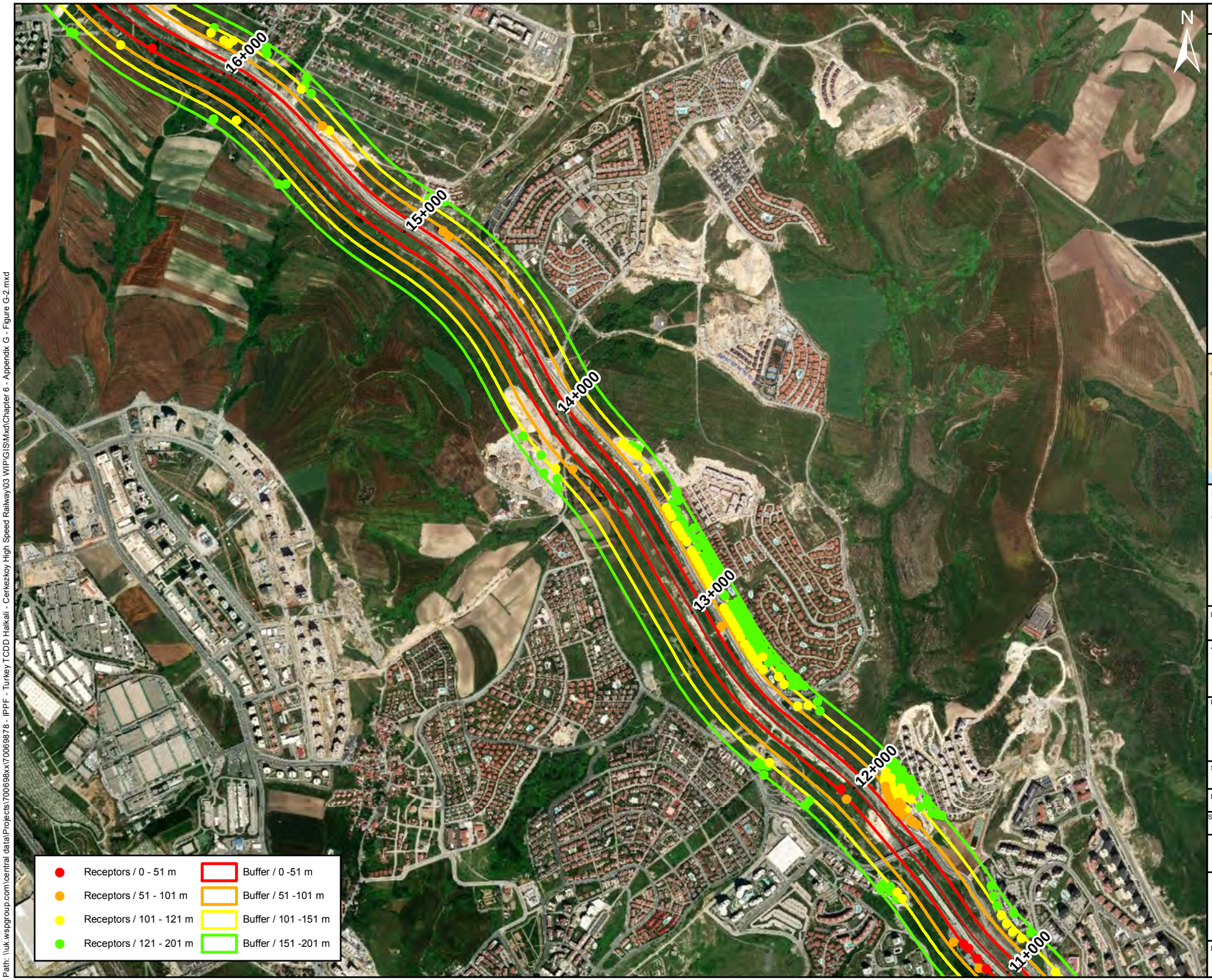
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Drawing Number

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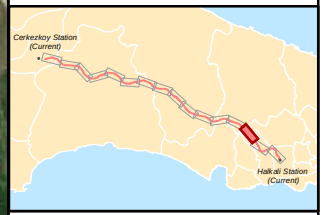
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

Proposed Railway Route



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

1:20,000

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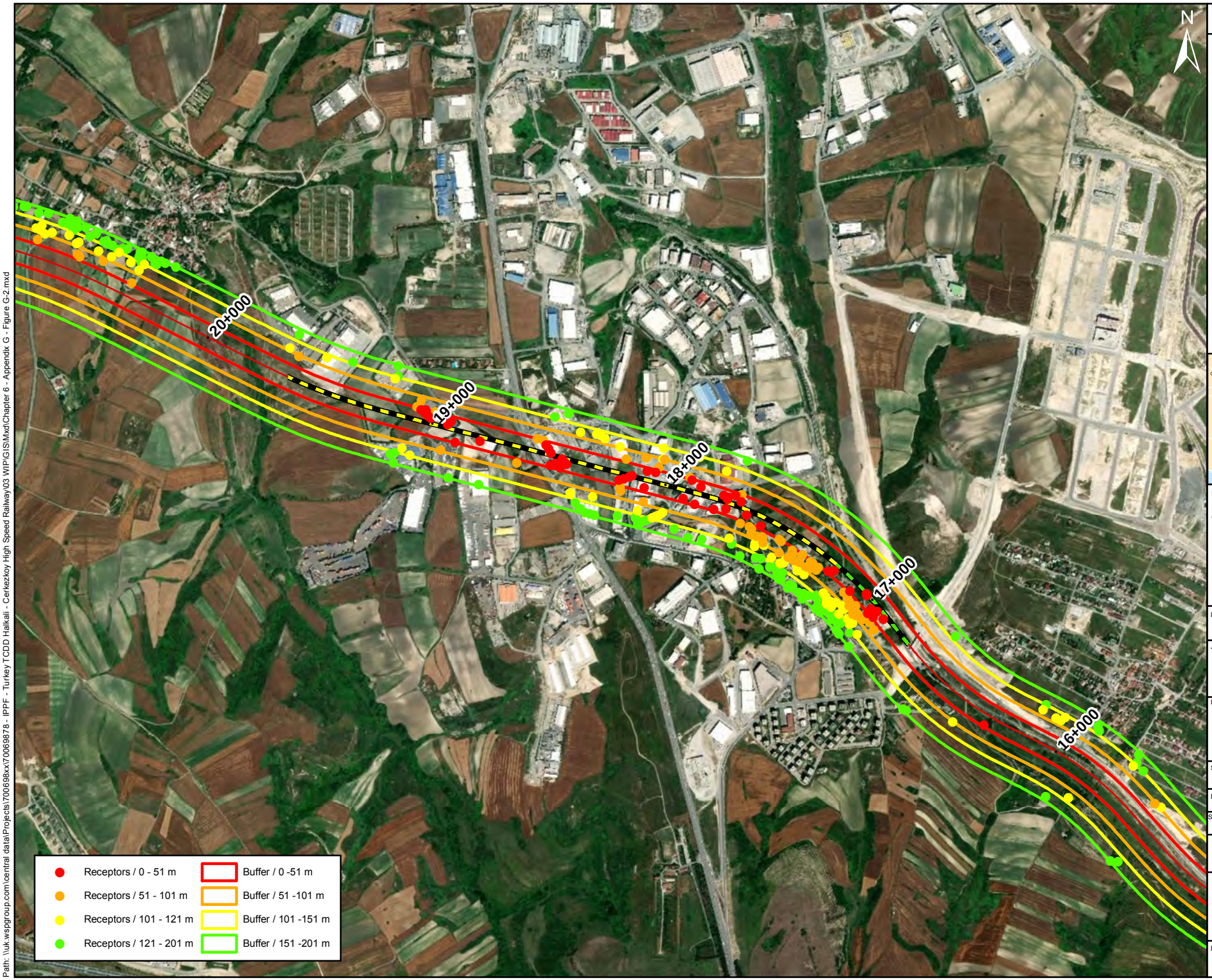
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Drawing Number

Figure 6-3 (3 / 17)

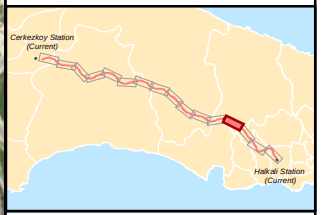
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Legend

- Proposed Railway Route
- Tunnel (NATM)
- Tunnel (Cut - Cover)



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

1:20,000

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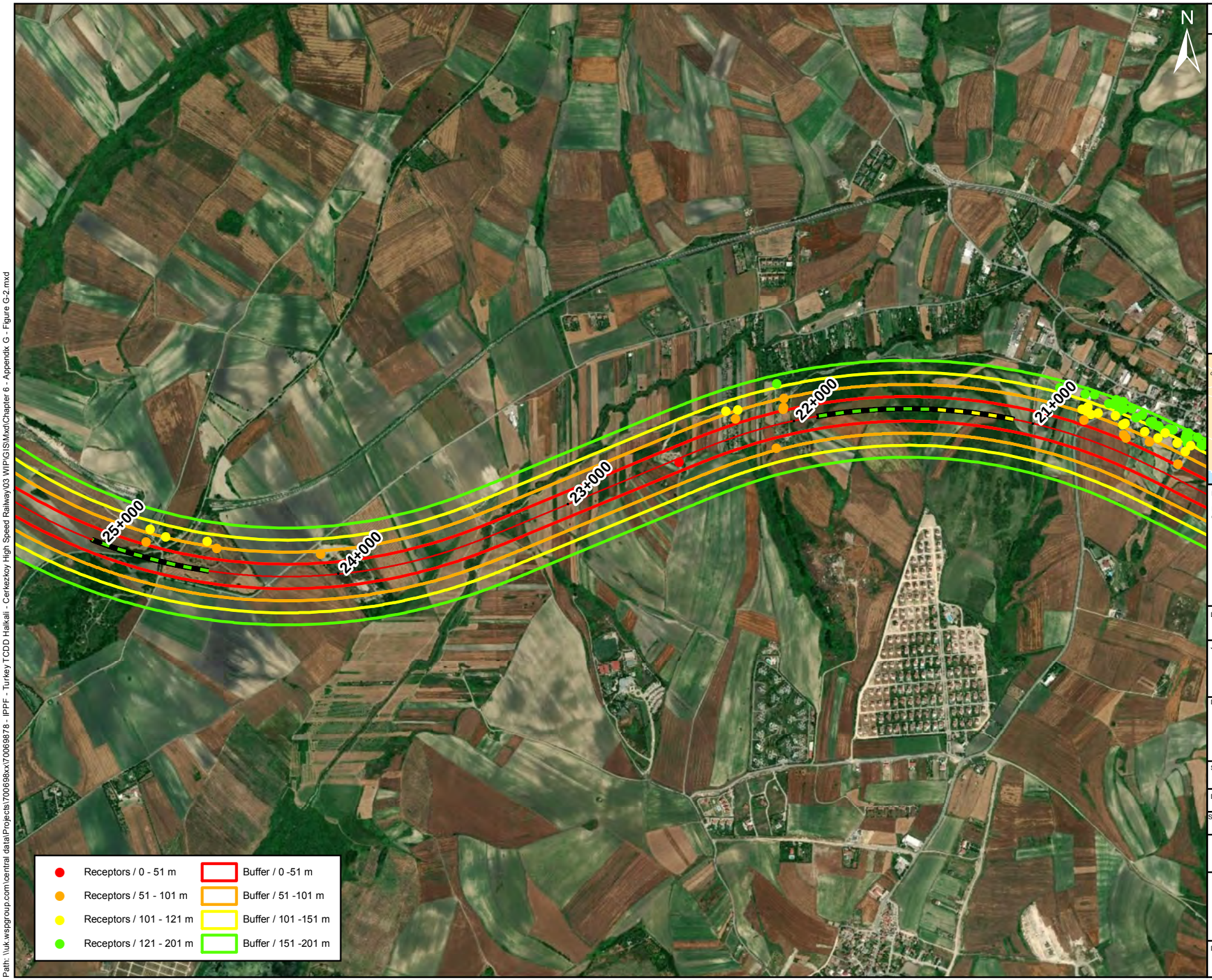
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Drawing Number

Figure 6-3 (4 / 17)

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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Tunnel (NATM)
- Tunnel (Cut - Cover)



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

1:20,000

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Stage 1 check	Stage 2 check	Originated	Date
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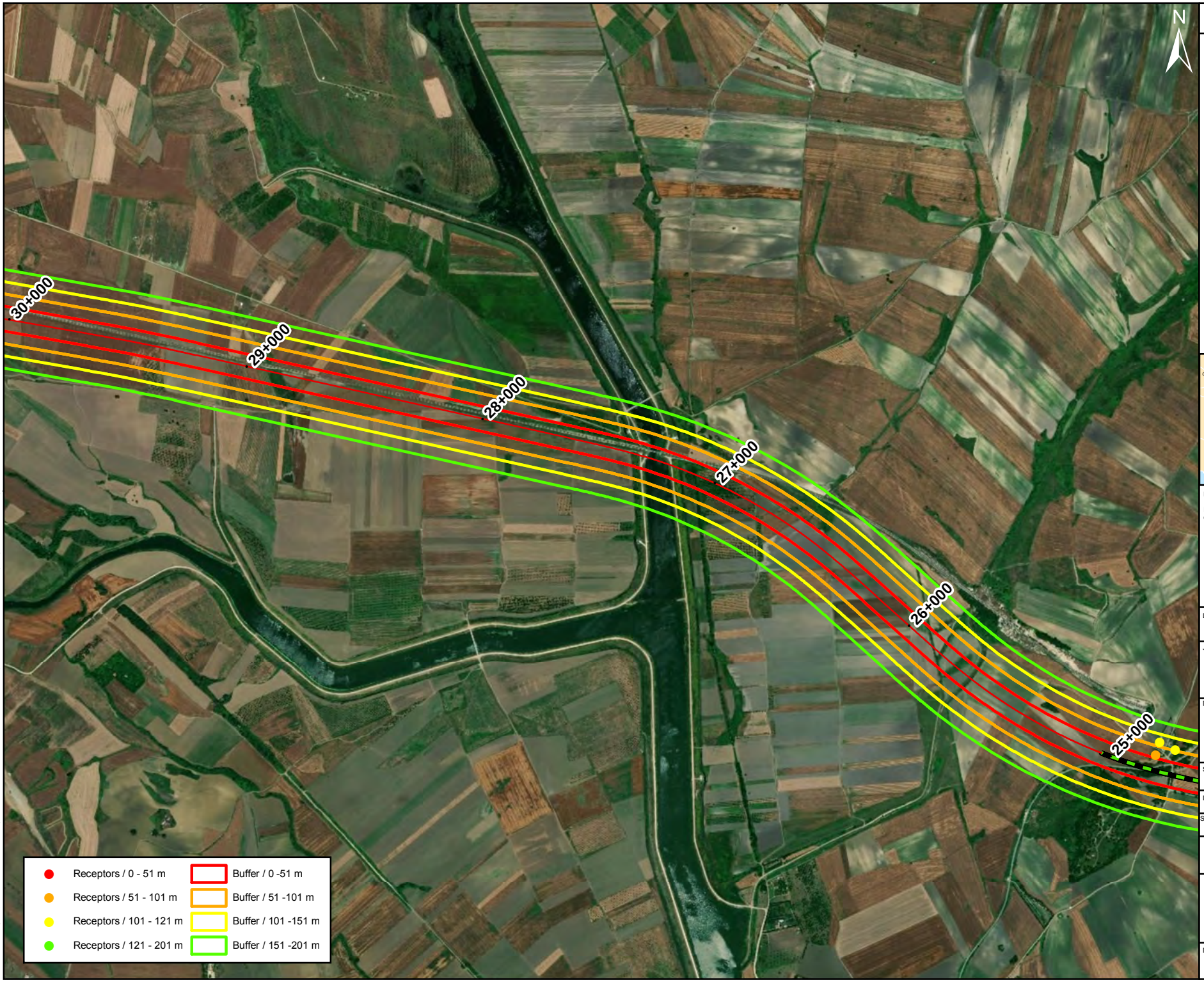
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Drawing Number

Figure 6-3 (5 / 17)

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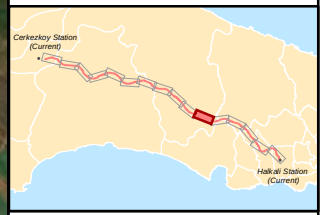


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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Tunnel (Cut - Cover)



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

1:20,000

Drawn			
DG			
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AD	JW	DG	02/03/2021

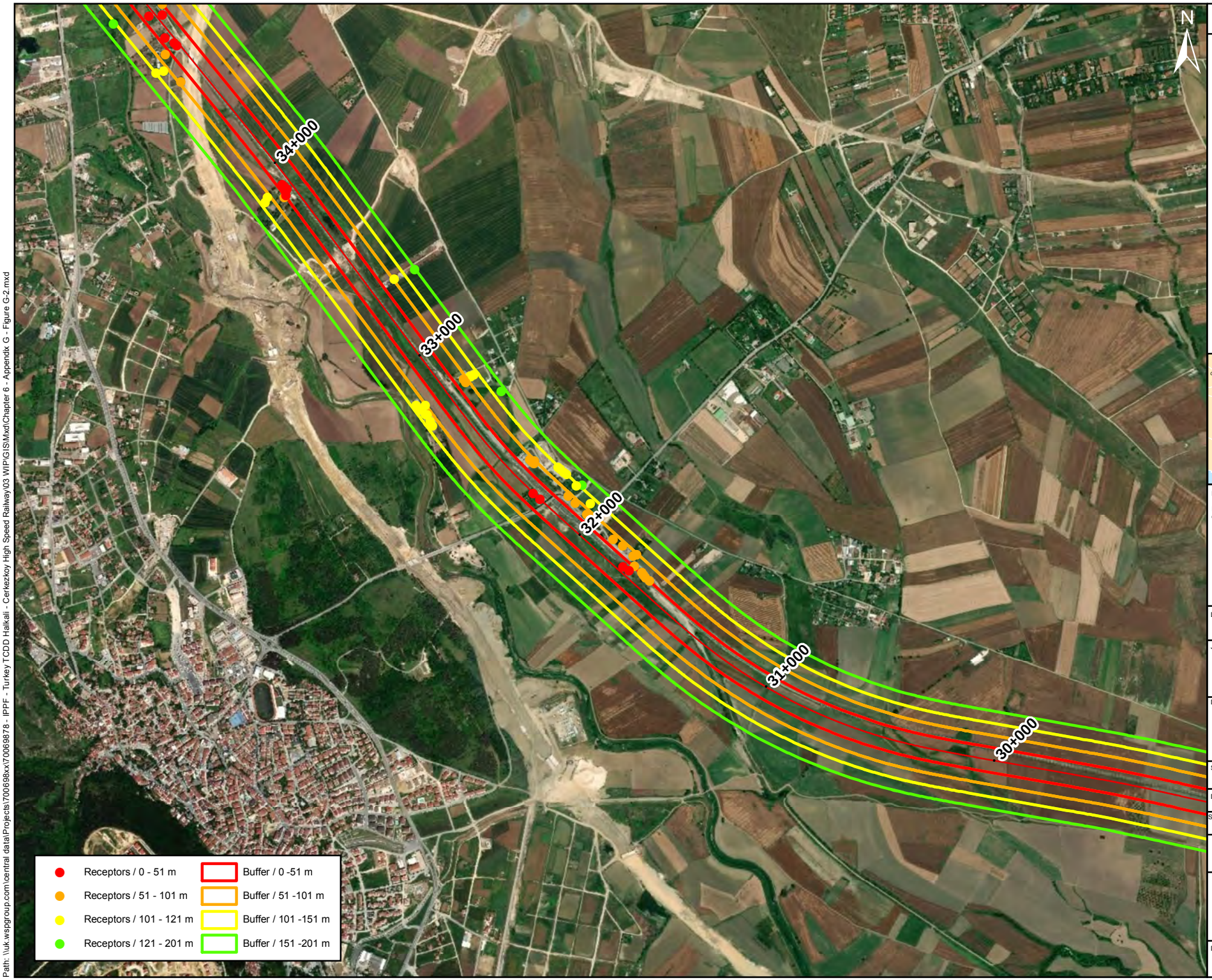
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Drawing Number

Figure 6-3 (6 / 17)



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Legend

Proposed Railway Route



Note:

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Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

1:20,000

Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
AD	JW	DG	02/03/2021

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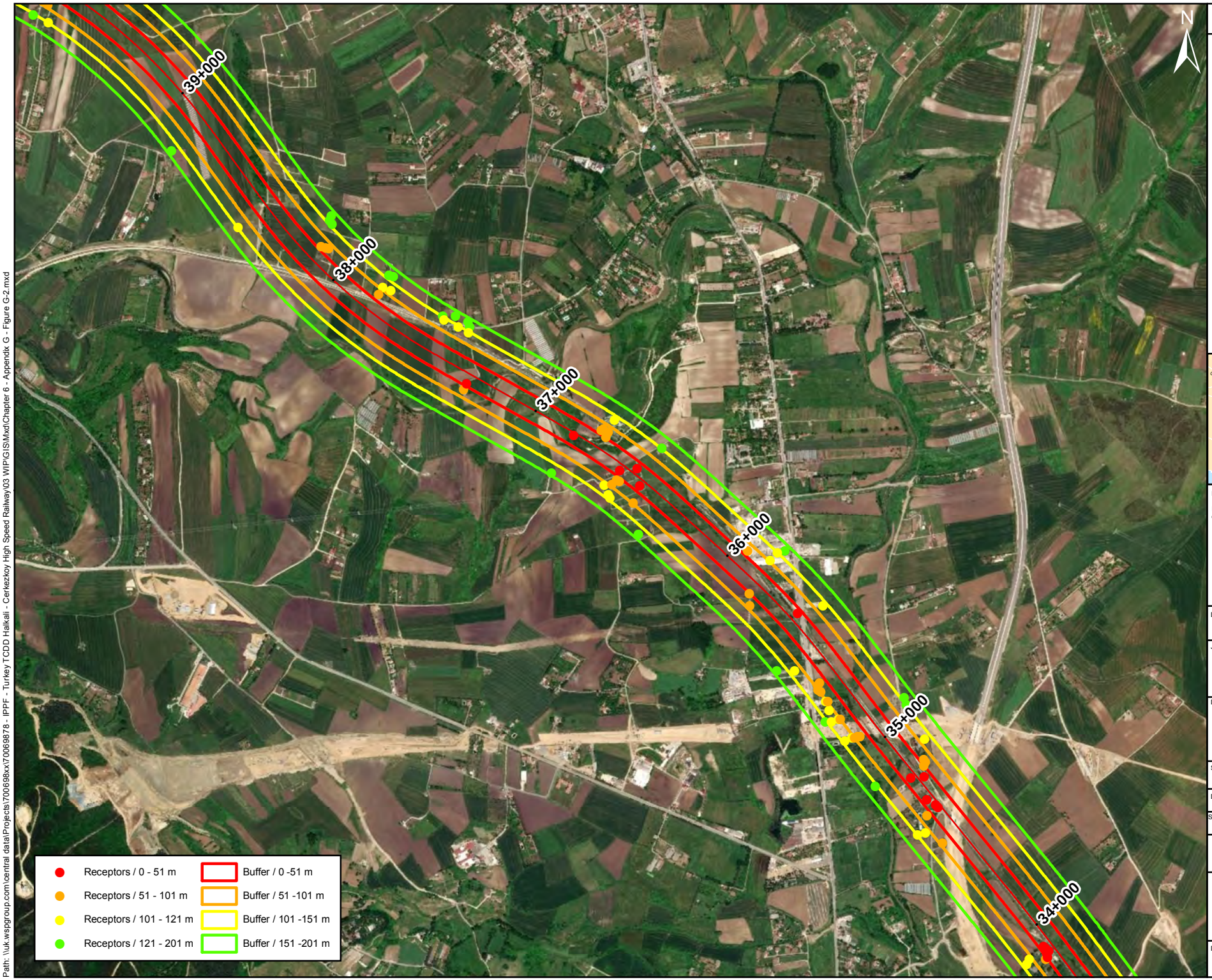
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Drawing Number

Figure 6-3 (7 / 17)

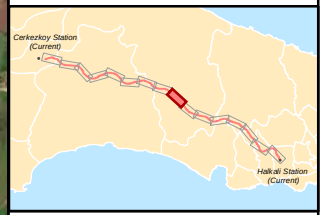
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Proposed Railway Route



Note:

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Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

1:20,000

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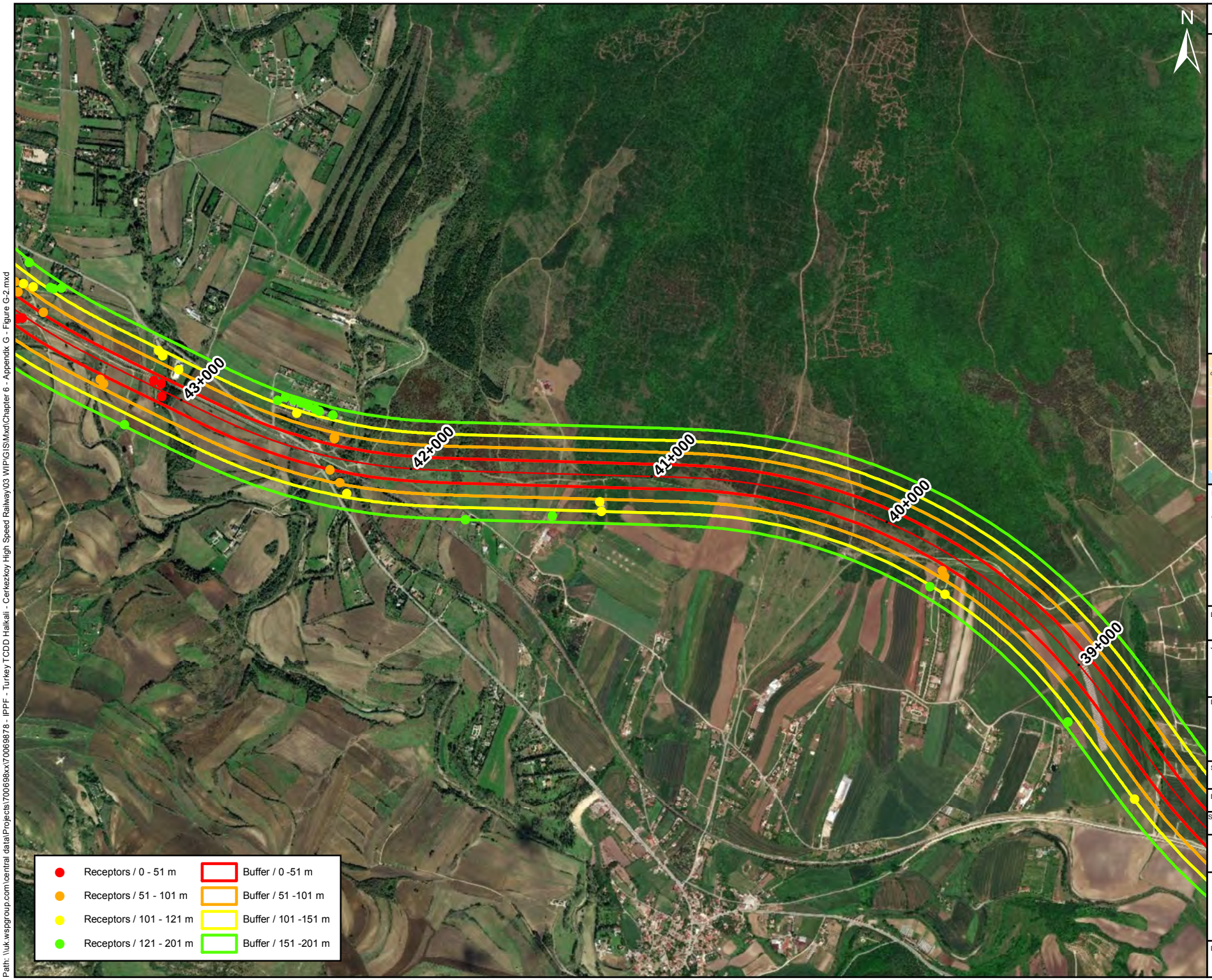
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Figure 6-3 (8 / 17)

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Legend

Proposed Railway Route



Note:

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Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

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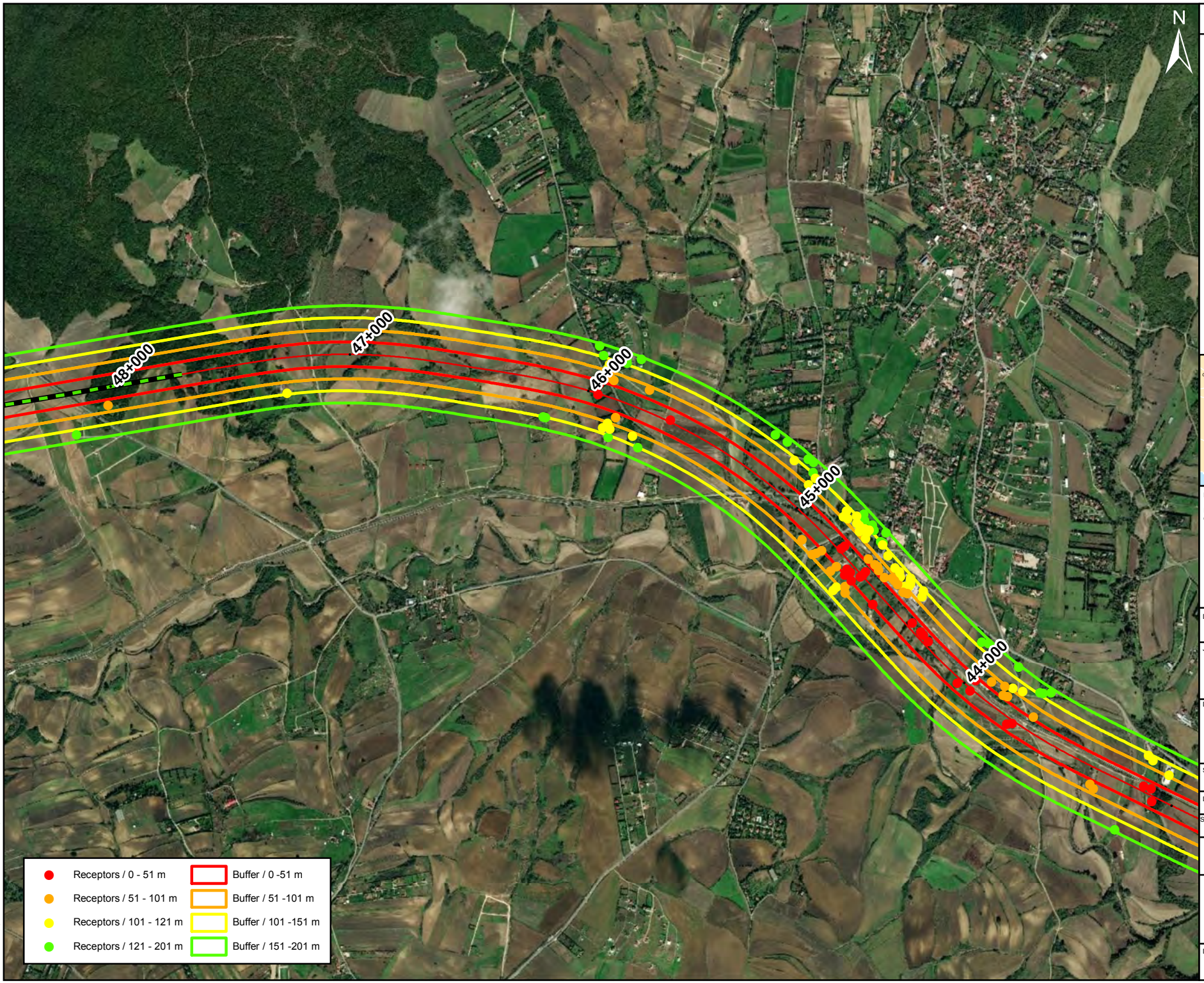
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Figure 6-3 (9 / 17)

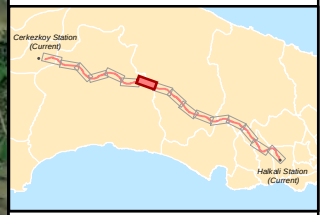
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Legend

- Proposed Railway Route
- Tunnel (Cut - Cover)



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

1:20,000

Drawn			
DG			
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AD	JW	DG	02/03/2021

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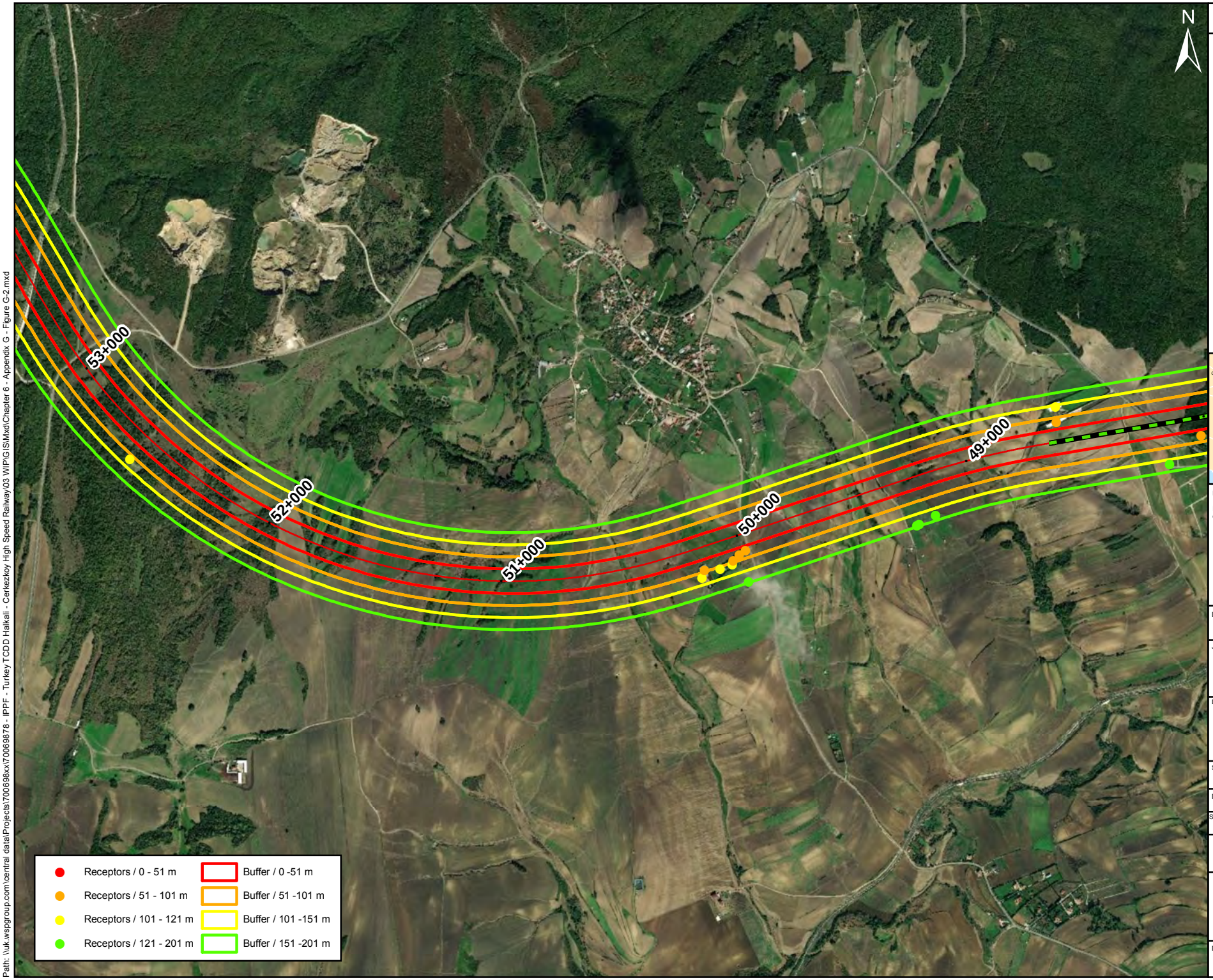
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Drawing Number

Figure 6-3 (10 / 17)

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Legend

- Proposed Railway Route
- Tunnel (Cut - Cover)



Note:

Information shown based on OpenStreetMap data, HOTOSM data, ESRI Imagery and Google Imagery.

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

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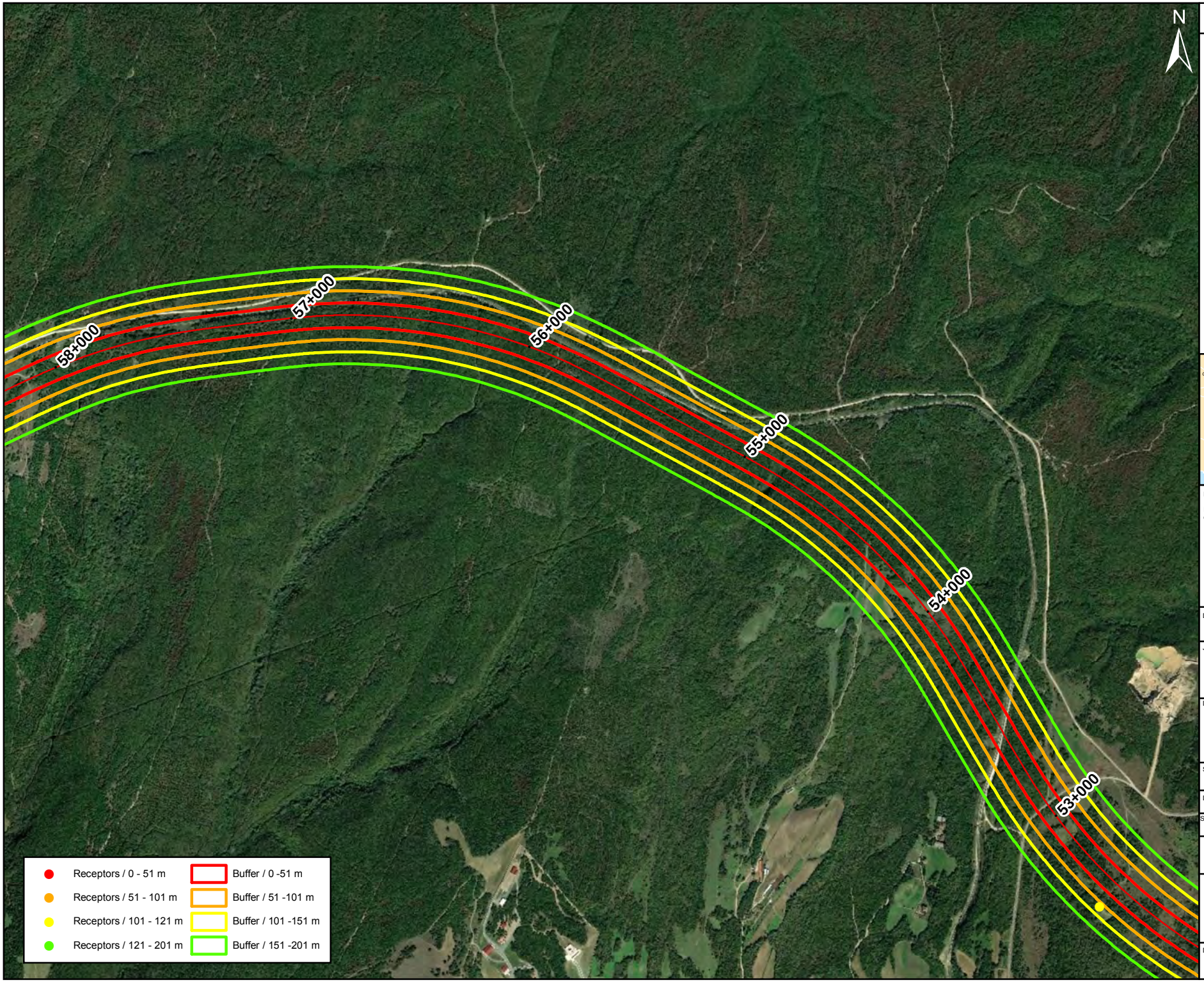
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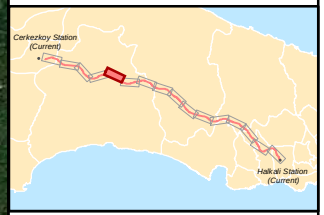
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Legend

Proposed Railway Route



Note:

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Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

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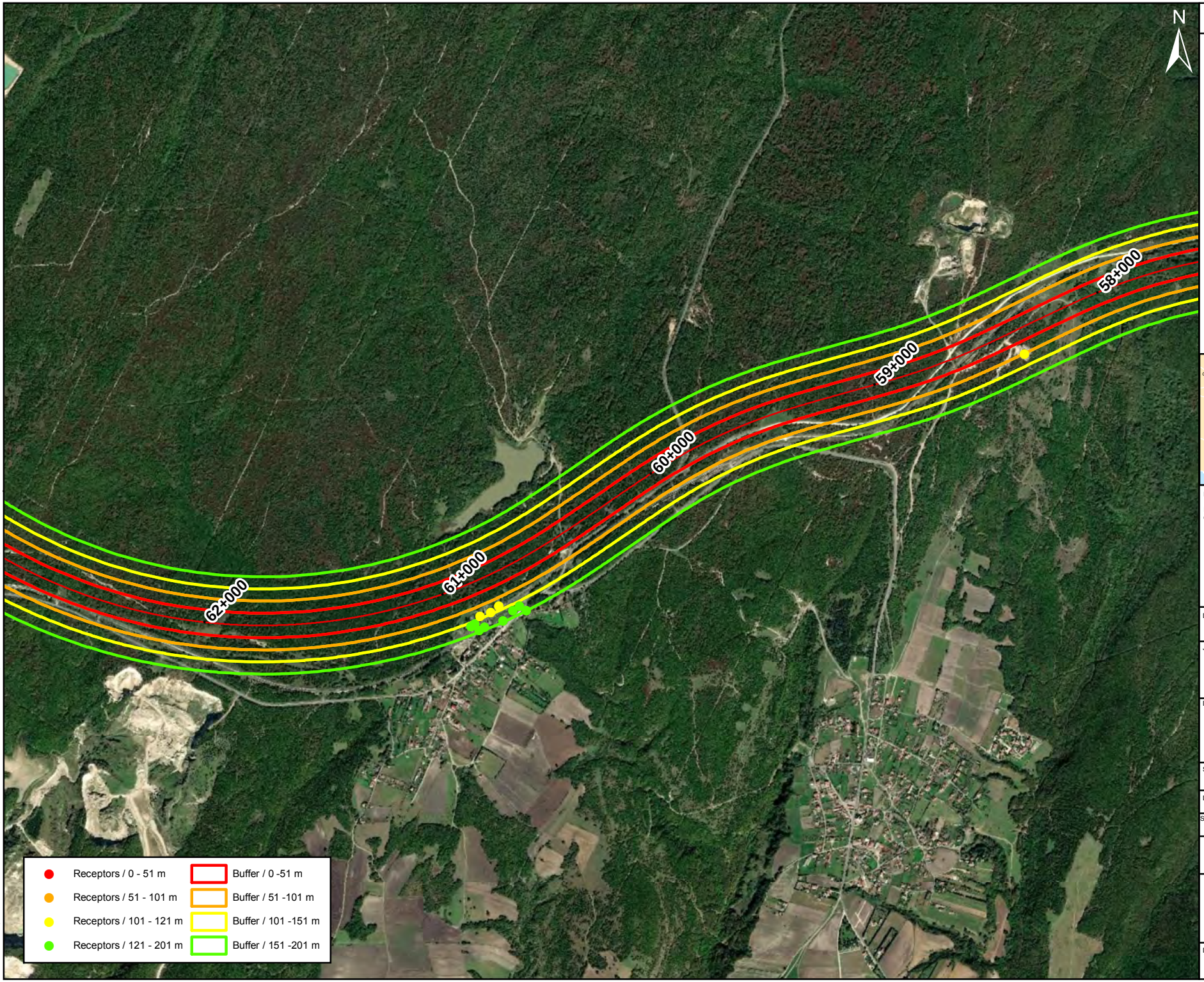
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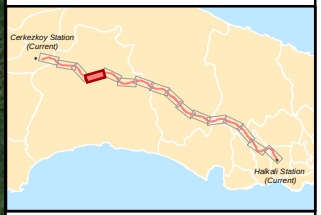
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Proposed Railway Route



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Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

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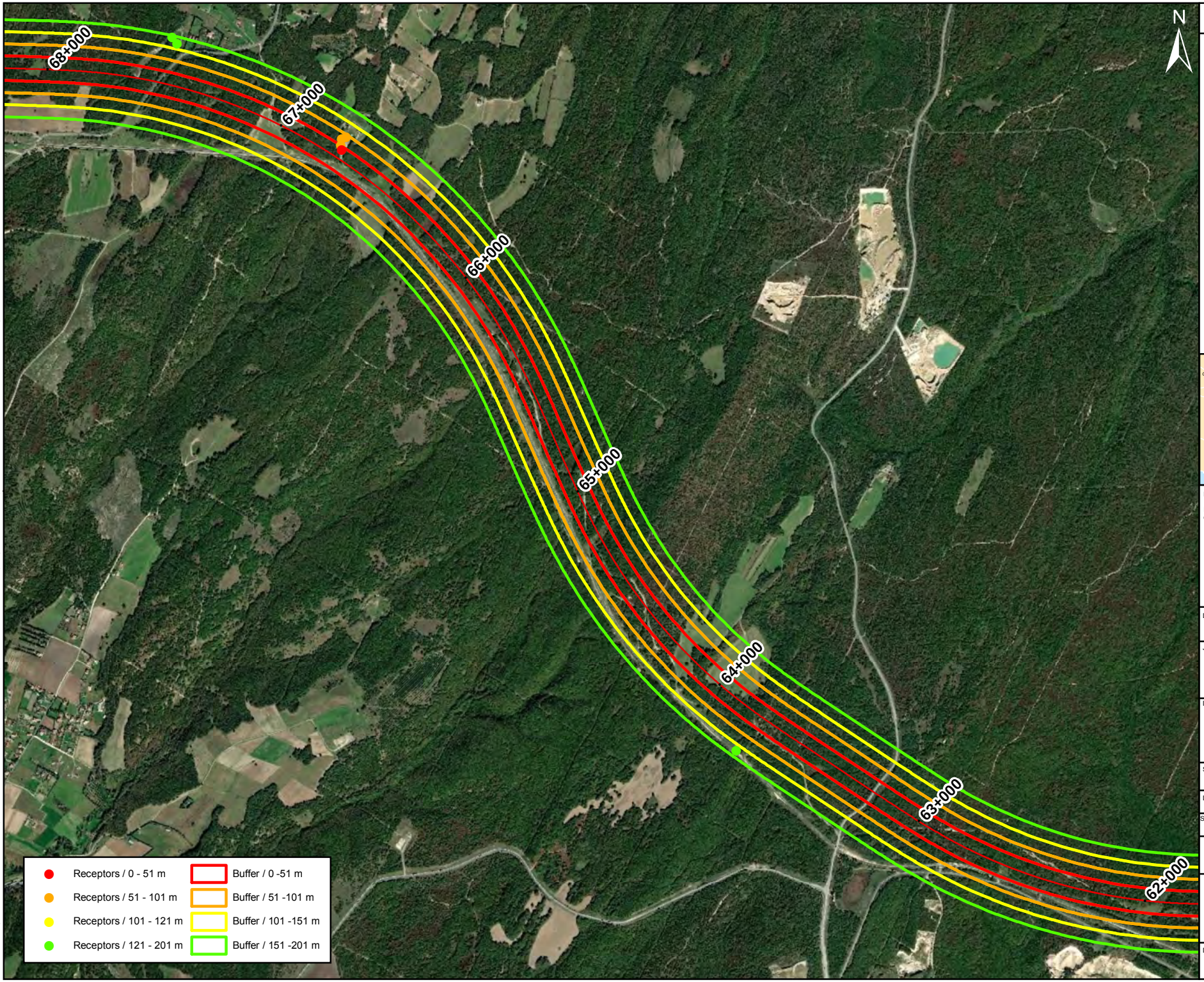
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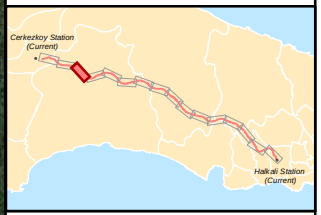
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Legend

Proposed Railway Route



Note:

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Drawing Status

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Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

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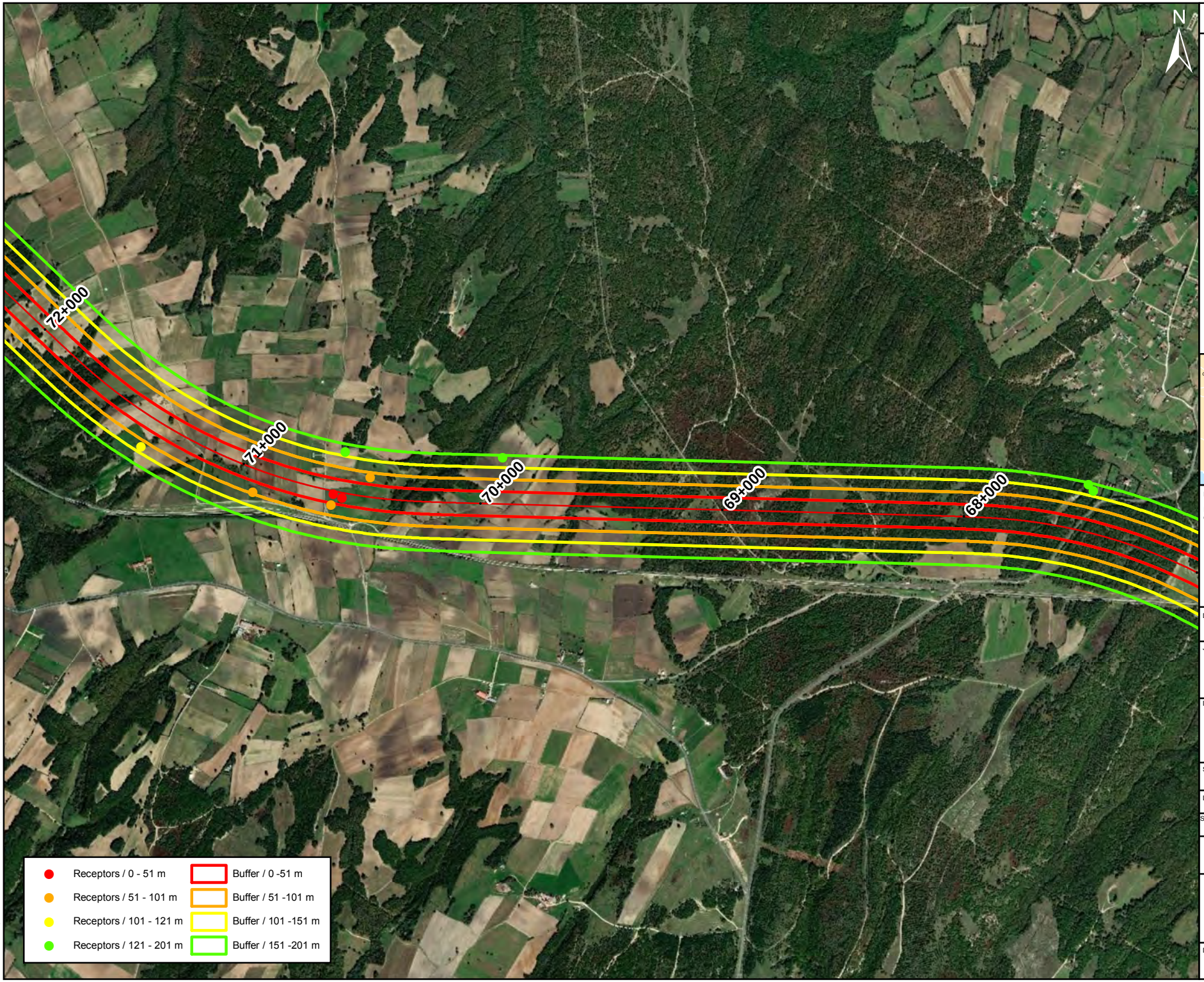
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Figure 6-3 (14 / 17)

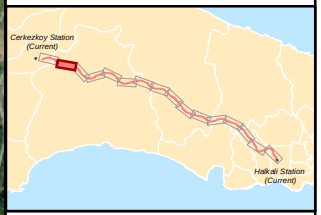
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Proposed Railway Route



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Drawing Status

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Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

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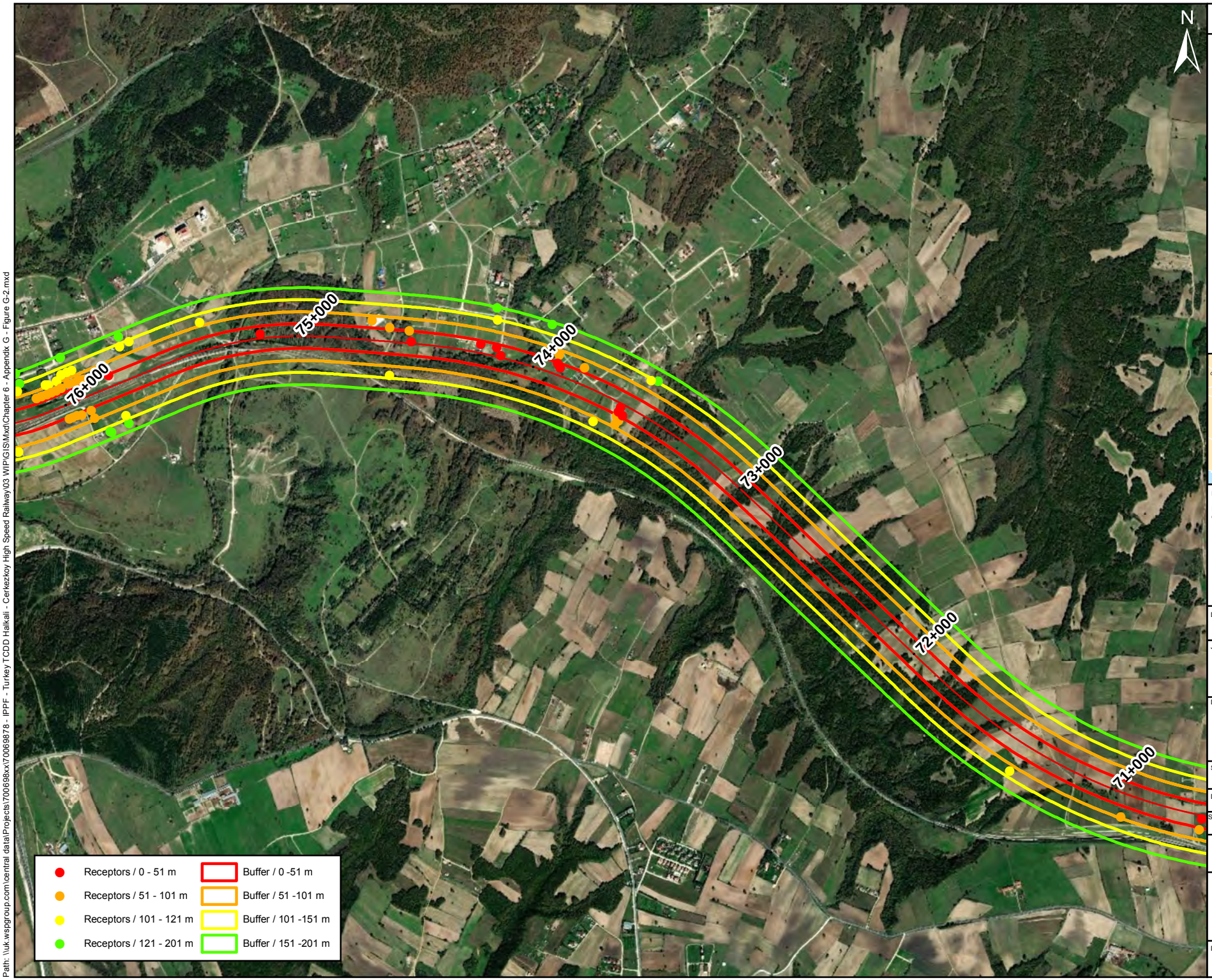
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Figure 6-3 (15 / 17)

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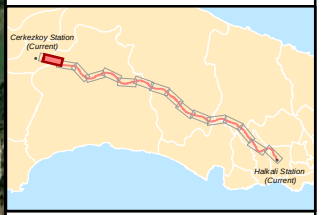


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Proposed Railway Route



Note:

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Drawing Status

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Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

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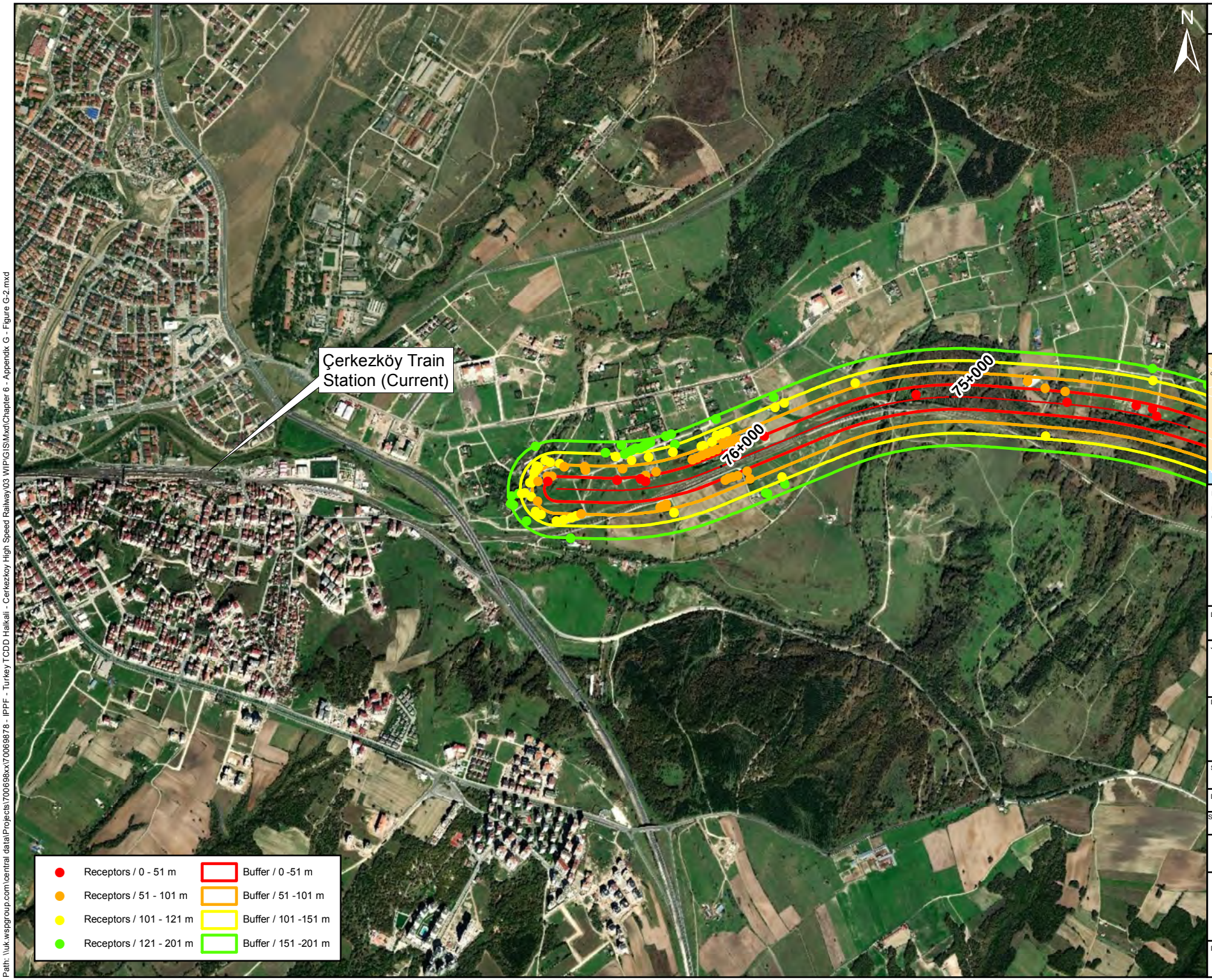
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Drawing Number

Figure 6-3 (16 / 17)

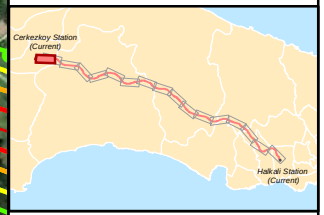


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Legend

Proposed Railway Route



Note:

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Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Figure 6-3 - Operational Exposure and Affected Receptors

Scale at A4

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Drawing Number

Figure 6-3 (17 / 17)

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Appendix I

CONSTRUCTION AND OPERATION NOISE MODELLING DATA (CHAPTER 7: NOISE AND VIBRATION)

Appendix I-1 - Construction Phase Plant Noise Assumptions

Phase 1 - Site Preparation				
Plant type	**BS 5228-1 Annex C Ref No**	**LAeq (dB) at 10m**	**Duration on Time (%)**	**Number of Items**
Ground excavation/earthworks: Tracked excavator	16	75	40	2
Ground excavation/earthworks: Dozer	13	78	40	2
Ground excavation/earthworks: Tracked excavator	18	75	40	2
Clearing site: Wheeled backhoe loader	8	68	50	2

Phase 2 - Earthworks				
Plant type	**BS 5228-1 Annex C Ref No**	**LAeq (dB) at 10m**	**Duration on Time (%)**	**Number of Items**
Ground excavation/earthworks: Tracked excavator	21	71	40	3
Breaking boulders/oversized material : Excavator mounted rock breaker	12	85	20	2
Ground excavation/earthworks: Dozer	13	78	40	1
Power for site cabins : Diesel generator	82	56	100	1
Mixing concrete : Large concrete mixer	22	76	40	2
Earthworks : Articulated dump truck	16	81	10	1
Rolling and compaction : Vibratory roller	24	84	60	2

Phase 3 - Bridge and Viaduct Construction				
Plant type	**BS 5228-1 Annex C Ref No**	**LAeq (dB) at 10m**	**Duration on Time (%)**	**Number of Items**
Tubular steel piling – hydraulic hammer : Hydraulic hammer rig	2	90	40	2
Dumping brick rubble : Articulated dump truck (dumping rubble)	11	80	40	3
Continuous flight auger piling – cast in situ : Concrete pump	26	75	25	1
Ground excavation/earthworks: Dozer	10	80	40	3
Lifting : Tracked mobile crane	50	71	30	1
Mixing concrete : Cement mixer truck (discharging)	18	75	30	2
Rolling and compaction : Vibratory roller	24	84	50	2

Phase 4 - Tunnel Boring Machine				
Plant type	**BS 5228-1 Annex C Ref No**	**LAeq (dB) at 10m**	**Duration on Time (%)**	**Number of Items**
Dumping brick rubble : Articulated dump truck (dumping rubble)	11	80	50	4
Lifting : Wheeled mobile crane	43	70	60	1
Waste delivery vehicles : Skip wagon	21	78	15	4
Rolling and compaction : Vibratory roller	25	75	40	2
Distribution of materials : Dumper (idling) C.4 #5	5	63	40	4
Mixing concrete : Cement mixer truck (discharging)	18	75	40	2
Tubular steel piling – hydraulic hammer : Hydraulic hammer rig	2	90	40	2

Phase 5 - Rail Track Construction				
Plant type	**BS 5228-1 Annex C Ref No**	**LAeq (dB) at 10m**	**Duration on Time (%)**	**Number of Items**
Mixing concrete : Cement mixer truck (discharging)	18	75	60	3
Breaking road surface : Road breaker (hand-held pneumatic)	4	86	40	2
Rolling and compaction : Vibratory roller	24	84	40	1
Mixing concrete : Cement mixer truck (discharging)	18	75	40	1
Pumping concrete : Concrete pump + cement mixer truck (discharging)	24	67	40	1

Appendix I-2 - Operational Train Flow Assumptions

2026: Halkali - Catalca				
Time Period	**Train Type**	**Calculation of Rail Noise (CRN) - Table A1.1: Equivalent Locomotive**	**Number of Trains**	**Representative Number of cars**
06:00 - 23:59	International	British Rail - Class 92	1	6
	Regional	British Rail - Class 91	5	6
	Express	377 Electrostar EMU*	5	6
	Freight	British Rail - Class 91	1.4	20
00:00 - 05:59	Freight	British Rail - Class 92	1	20
** Taken from Additional Railway Noise Source Terms for CRN95 (Defra) 2007*				

2026: Catalca - Cezkerkoy				
Time Period	**Train Type**	**Calculation of Rail Noise (CRN) - Table A1.1: Equivalent Locomotive**	**Number of Trains**	**Representative Number of cars**
06:00 - 23:59	International	British Rail - Class 92	1	6
	Regional	British Rail - Class 91	5	6
	Express	377 Electrostar EMU*	5	6
	Freight	British Rail - Class 91	1.4	20
00:00 - 05:59	Freight	British Rail - Class 92	1.9	20
** Taken from Additional Railway Noise Source Terms for CRN95 (Defra) 2007*				

2041: Halkali - Catalca				
Time Period	**Train Type**	**Calculation of Rail Noise (CRN) - Table A1.1: Equivalent Locomotive**	**Number of Trains**	**Representative Number of cars**
06:00 - 23:59	International	British Rail - Class 92	2	6
	Regional	British Rail - Class 91	8	6
	Express	377 Electrostar EMU*	8	6
	Freight	British Rail - Class 91	2	20
00:00 - 05:59	Freight	British Rail - Class 92	1	20
** Taken from Additional Railway Noise Source Terms for CRN95 (Defra) 2007*				

2041: Catalca - Cezkerkoy				
Time Period	**Train Type**	**Calculation of Rail Noise (CRN) - Table A1.1: Equivalent Locomotive**	**Number of Trains**	**Representative Number of cars**
06:00 - 23:59	International	British Rail - Class 92	2	6
	Regional	British Rail - Class 91	8	6
	Express	377 Electrostar EMU*	8	6
	Freight	British Rail - Class 91	4	20
00:00 - 05:59	Freight	British Rail - Class 92	4	20
** Taken from Additional Railway Noise Source Terms for CRN95 (Defra) 2007*				

Appendix J

NOISE MODELLING RESULTS (CHAPTER 7: NOISE AND VIBRATION)

Number of Receptors subject to Magnitude of Operation Noise and Turkish Environmental Noise Limits

Table B1: 2026 - Daytime No Mitigation							
Community Area	Total Receptors	Magnitude of Operational Noise					Regulation of Environmental Noise
		No Change	Slight	Moderate	Large	Very Large	Day/Evening
Bahçeşehir	869	869	0	0	0	0	0
Bahşayış	7	7	0	0	0	0	0
Bekirli	18	18	0	0	0	0	0
Çatalca	35	35	0	0	0	0	0
Çayirdere	22	22	0	0	0	0	0
Ferhatpasa	3	3	0	0	0	0	0
Gökçeali	46	45	1	0	0	0	0
Halkili	1496	1490	6	0	0	0	0
Incegiz	36	35	1	0	0	0	1
Istasyon	165	165	0	0	0	0	0
Kabakça	153	153	0	0	0	0	0
Kaleiçi	62	59	2	1	0	0	0
Küçüksinekli	31	31	0	0	0	0	0
Ömerli	293	293	0	0	0	0	0
Yeşilbayır	132	132	0	0	0	0	0

Table B2: 2026 - Daytime With Mitigation							
Community Area	Total Receptors	Magnitude of Operational Noise					Regulation of Environmental Noise
		No Change	Slight	Moderate	Large	Very Large	Day/Evening
Bahçeşehir	869	869	0	0	0	0	0
Bahşayış	7	7	0	0	0	0	0
Bekirli	18	18	0	0	0	0	0
Çatalca	35	35	0	0	0	0	0
Çayirdere	22	22	0	0	0	0	0
Ferhatpasa	3	3	0	0	0	0	0
Gökçeali	46	46	0	0	0	0	0
Halkili	1496	1496	0	0	0	0	0
Incegiz	36	36	0	0	0	0	0
Istasyon	165	165	0	0	0	0	0
Kabakça	153	153	0	0	0	0	0
Kaleiçi	62	62	0	0	0	0	0
Küçüksinekli	31	31	0	0	0	0	0
Ömerli	293	293	0	0	0	0	0
Yeşilbayır	132	132	0	0	0	0	0

Table B3: 2026 - Night-Time No Mitigation							
Community Area	Total Receptors	Magnitude of Operational Noise					Regulation of Environmental Noise
		No Change	Slight	Moderate	Large	Very Large	Night
Bahçeşehir	869	869	0	0	0	0	0
Bahşayış	7	7	0	0	0	0	0
Bekirli	18	18	0	0	0	0	0
Çatalca	35	35	0	0	0	0	0
Çayirdere	22	22	0	0	0	0	0
Ferhatpasa	3	3	0	0	0	0	0
Gökçeali	46	46	0	0	0	0	0
Halkili	1496	1496	0	0	0	0	0
Incegiz	36	35	0	1	0	0	1
Istasyon	165	165	0	0	0	0	0
Kabakça	153	153	0	0	0	0	0
Kaleiçi	62	54	2	1	5	0	6
Küçüksinekli	31	31	0	0	0	0	0
Ömerli	293	293	0	0	0	0	0
Yeşilbayır	132	132	0	0	0	0	0

Table B4: 2026 - Night-Time With Mitigation							
Community Area	Total Receptors	Magnitude of Operational Noise					Regulation of Environmental Noise
		No Change	Slight	Moderate	Large	Very Large	Night
Bahçeşehir	869	869	0	0	0	0	0
Bahşayış	7	7	0	0	0	0	0
Bekirli	18	18	0	0	0	0	0
Çatalca	35	35	0	0	0	0	0
Çayirdere	22	22	0	0	0	0	0
Ferhatpasa	3	3	0	0	0	0	0
Gökçealii	46	46	0	0	0	0	0
Halkili	1496	1496	0	0	0	0	0
Incegiz	36	36	0	0	0	0	0
Istasyon	165	165	0	0	0	0	0
Kabakça	153	153	0	0	0	0	0
Kaleiçi	62	62	0	0	0	0	0
Küçüksinekli	31	31	0	0	0	0	0
Ömerli	293	293	0	0	0	0	0
Yeşilbayır	132	132	0	0	0	0	0

Table B5: 2041 - Daytime No Mitigation							
Community Area	Total Receptors	Magnitude of Operational Noise					Regulation of Environmental Noise
		No Change	Slight	Moderate	Large	Very Large	Day/Evening
Bahçeşehir	869	869	0	0	0	0	4
Bahşayış	7	7	0	0	0	0	0
Bekirli	18	18	0	0	0	0	0
Çatalca	35	35	0	0	0	0	0
Çayirdere	22	22	0	0	0	0	0
Ferhatpasa	3	3	0	0	0	0	0
Gökçeali	46	43	0	3	0	0	0
Halkili	1496	1484	5	7	0	0	0
Incegiz	36	35	0	1	0	0	1
Istasyon	165	165	0	0	0	0	7
Kabakça	153	153	0	0	0	0	1
Kaleiçi	62	55	1	5	1	0	1
Küçüksinekli	31	31	0	0	0	0	0
Ömerli	293	292	1	0	0	0	1
Yeşilbayır	132	132	0	0	0	0	0

Table B6: 2041 - Daytime With Mitigation							
Community Area	Total Receptors	Magnitude of Operational Noise					Regulation of Environmental Noise
		No Change	Slight	Moderate	Large	Very Large	Day/Evening
Bahçeşehir	869	869	0	0	0	0	0
Bahşayış	7	7	0	0	0	0	0
Bekirli	18	18	0	0	0	0	0
Çatalca	35	35	0	0	0	0	0
Çayirdere	22	22	0	0	0	0	0
Ferhatpasa	3	3	0	0	0	0	0
Gökçeali	46	46	0	0	0	0	0
Halkili	1496	1496	0	0	0	0	0
Incegiz	36	36	0	0	0	0	0
Istasyon	165	165	0	0	0	0	0
Kabakça	153	153	0	0	0	0	0
Kaleiçi	62	62	0	0	0	0	0
Küçüksinekli	31	31	0	0	0	0	0
Ömerli	293	293	0	0	0	0	0
Yeşilbayır	132	132	0	0	0	0	0

Table B7: 2041 - Night-Time No Mitigation							
Community Area	Total Receptors	Magnitude of Operational Noise					Regulation of Environmental Noise
		No Change	Slight	Moderate	Large	Very Large	Night
Bahçeşehir	869	869	0	0	0	0	0
Bahşayış	7	7	0	0	0	0	0
Bekirli	18	18	0	0	0	0	0
Çatalca	35	33	2	0	0	0	0
Çayirdere	22	22	0	0	0	0	0
Ferhatpasa	3	3	0	0	0	0	0
Gökçeali	46	43	1	2	0	0	0
Halkili	1496	1496	0	0	0	0	0
Incegiz	36	35	0	0	1	0	1
Istasyon	165	158	4	3	0	0	9
Kabakça	153	152	1	0	0	0	1
Kaleiçi	62	50	2	4	0	6	6
Küçüksinekli	31	31	0	0	0	0	0
Ömerli	293	293	0	0	0	0	0
Yeşilbayır	132	132	0	0	0	0	0

Table B8: 2041 - Night-Time With Mitigation							
Community Area	Total Receptors	Magnitude of Operational Noise					Regulation of Environmental Noise
		No Change	Slight	Moderate	Large	Very Large	Night
Bahçeşehir	869	869	0	0	0	0	0
Bahşayış	7	7	0	0	0	0	0
Bekirli	18	18	0	0	0	0	0
Çatalca	35	35	0	0	0	0	0
Çayirdere	22	22	0	0	0	0	0
Ferhatpasa	3	3	0	0	0	0	0
Gökçeali	46	46	0	0	0	0	0
Halkili	1496	1496	0	0	0	0	0
Incegiz	36	36	0	0	0	0	0
Istasyon	165	165	0	0	0	0	0
Kabakça	153	153	0	0	0	0	0
Kaleiçi	62	61	1	0	0	0	0
Küçüksinekli	31	31	0	0	0	0	0
Ömerli	293	293	0	0	0	0	0
Yeşilbayır	132	132	0	0	0	0	0

Appendix K

NOISE MONITORING FORMS (CHAPTER 7: NOISE AND VIBRATION)

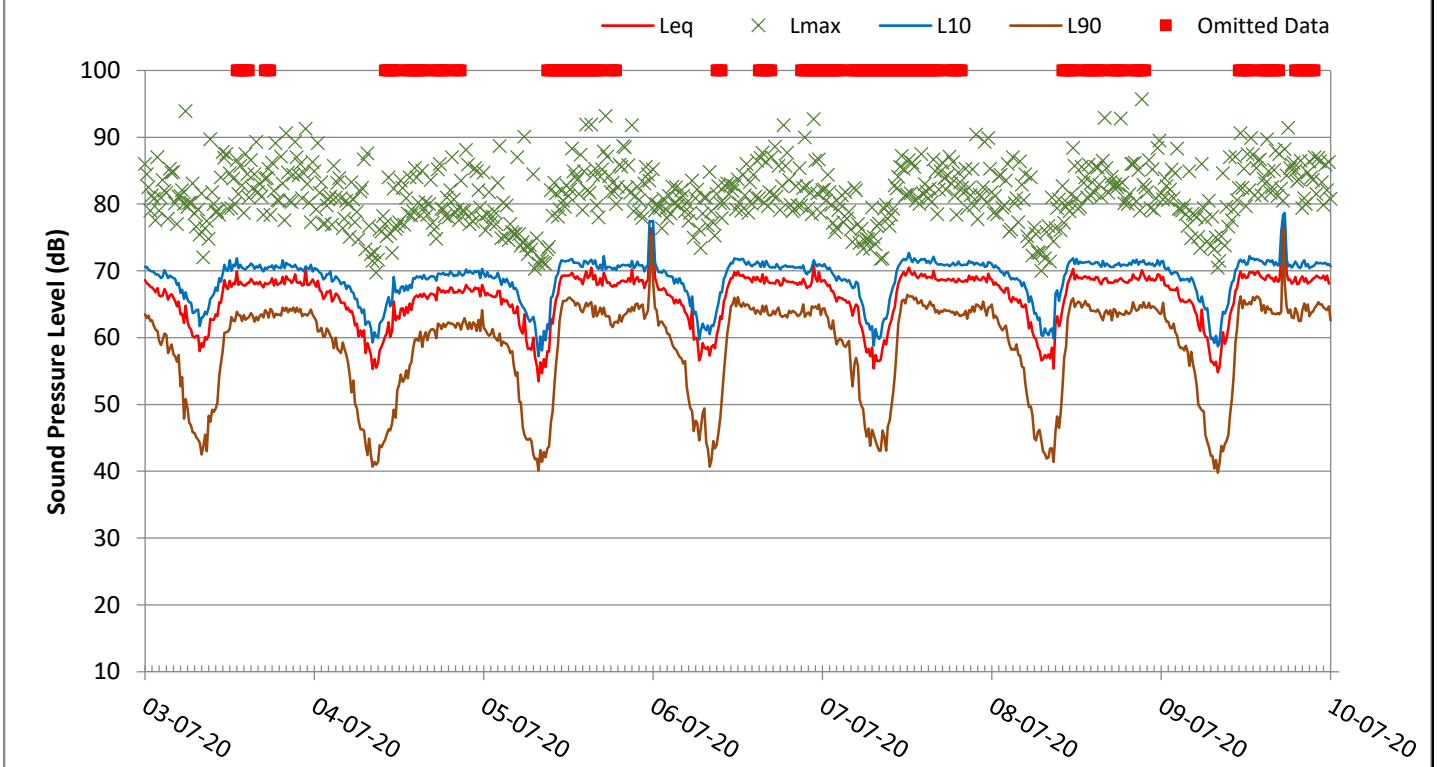
Noise Monitoring Form

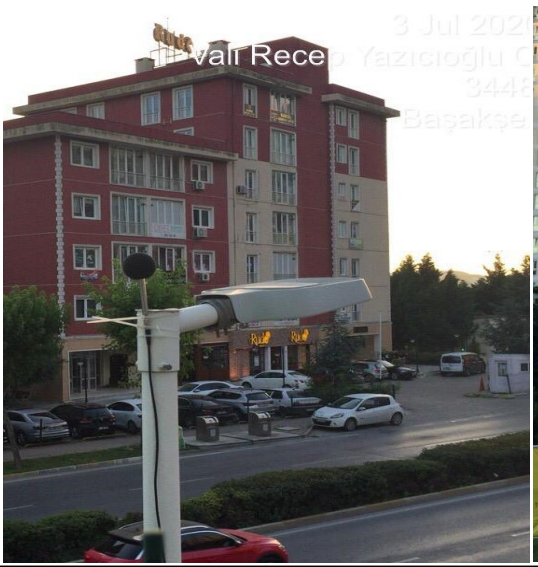
Project Name:	TCDD Halkali - Cerkezkoy HS Railway	**Project No:**	70069878
Location:	LT1	**Engineer:**	Çınar Mühendislik
Equipment:		**Weather:**	Periods of high winds (>5m/s) have been omitted from the dataset.
Coordinates UTM35N	X:642286.3627 - Y:4548068.8221		

Measurement Period

Date	Start / Stop Time	Measurement Intervals
03/07/2020	20:00	15 min
10/07/2020	20:00	

Description of Audible Noise







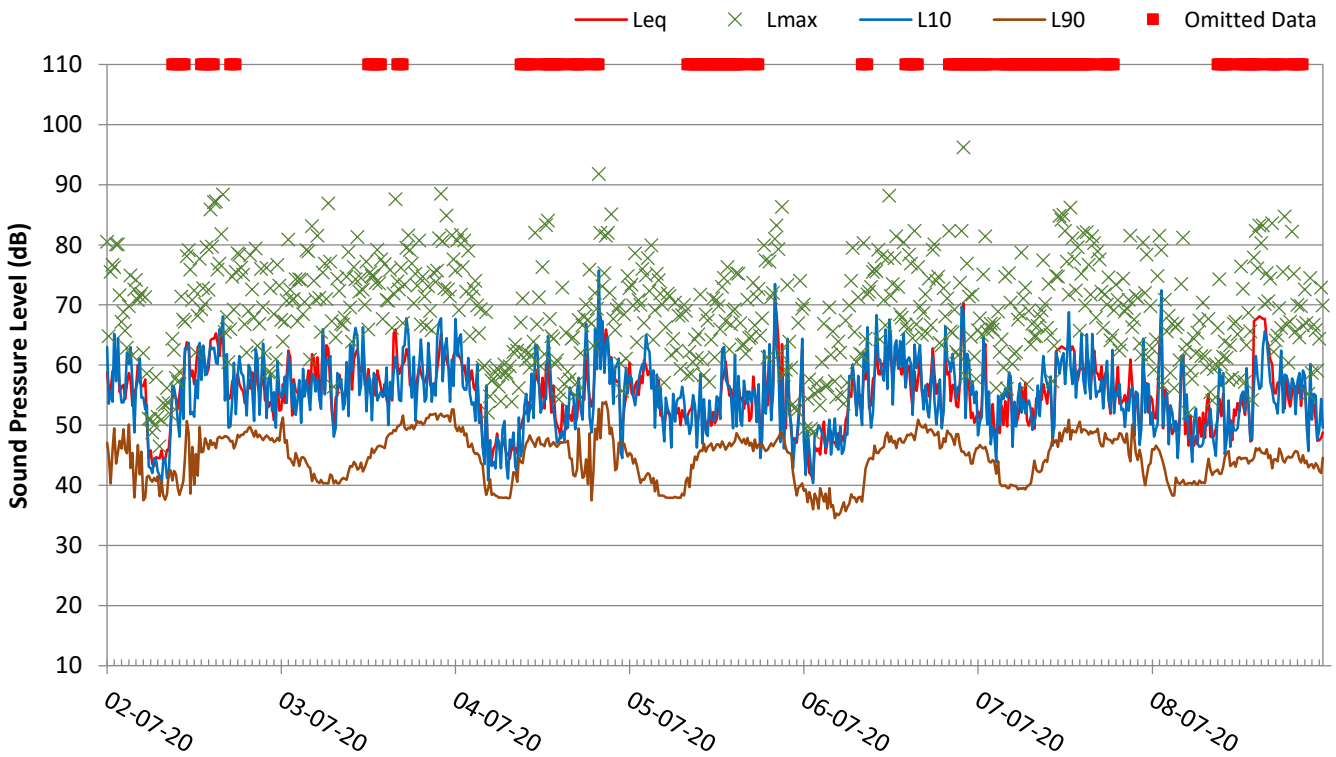
Noise Monitoring Form

Project Name:	TCDD Halkali - Cerkezkoy HS Railway	**Project No:**	70069878
Location:	LT2	**Engineer:**	Çınar Mühendislik
Equipment:		**Weather:**	Periods of high winds (>5m/s) have been omitted from the dataset.
Coordinates UTM35N	X:637725.0224 - Y:4553056.0448		

Measurement Period

Date	Start / Stop Time	Measurement Intervals
02/07/2020	21:00	15 min
09/07/2020	20:29	

Description of Audible Noise



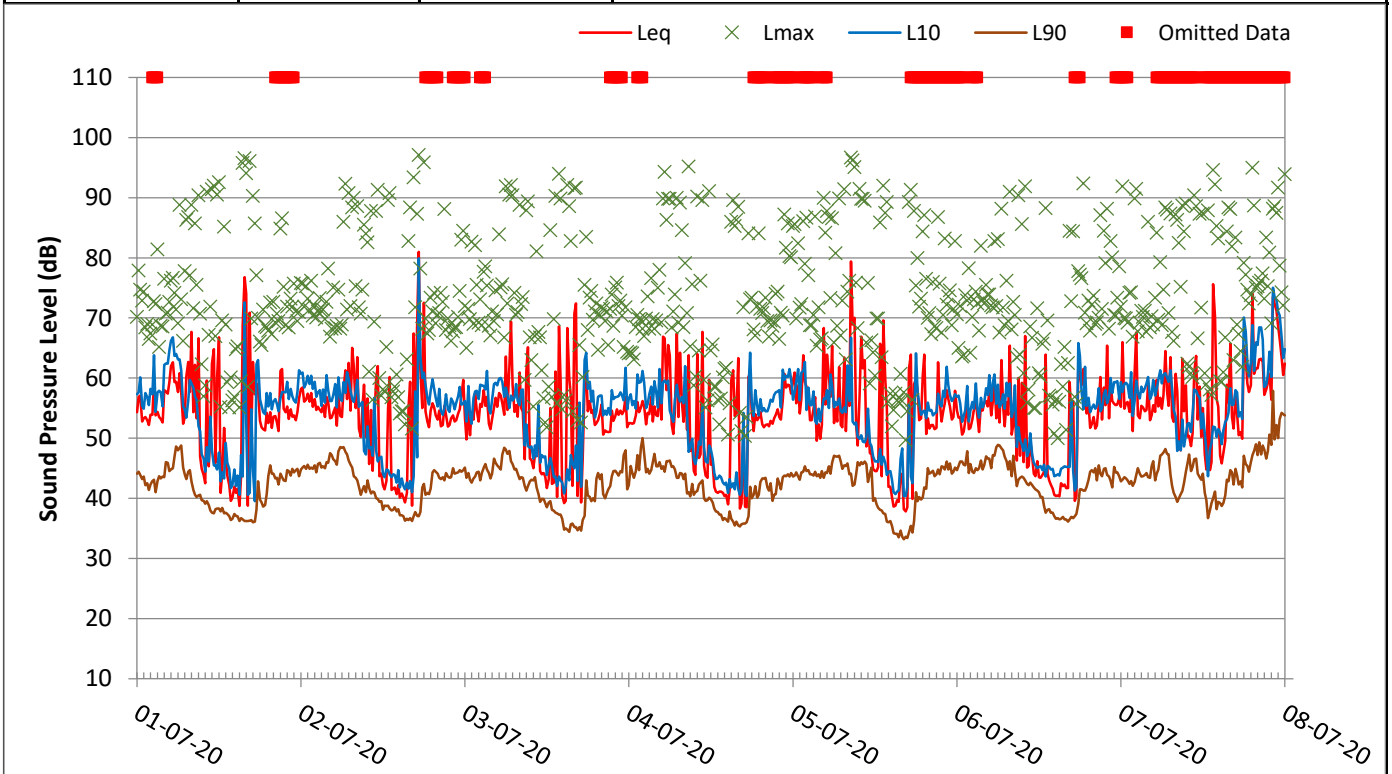




Noise Monitoring Form

Project Name:	TCDD Halkali - Cerkezkoy HS Railway	**Project No:**	70069878
Location:	LT3	**Engineer:**	Çınar Mühendislik
Equipment:		**Weather:**	Periods of high winds (>5m/s) have been omitted from the dataset.
Coordinates UTM35N	X:634614.1346 - Y:4554240.1621		

Measurement Period			**Description of Audible Noise**
Date	**Start / Stop Time**	**Measurement Intervals**	
01/07/2020 08/07/2020	11:45 11:45	15 min	





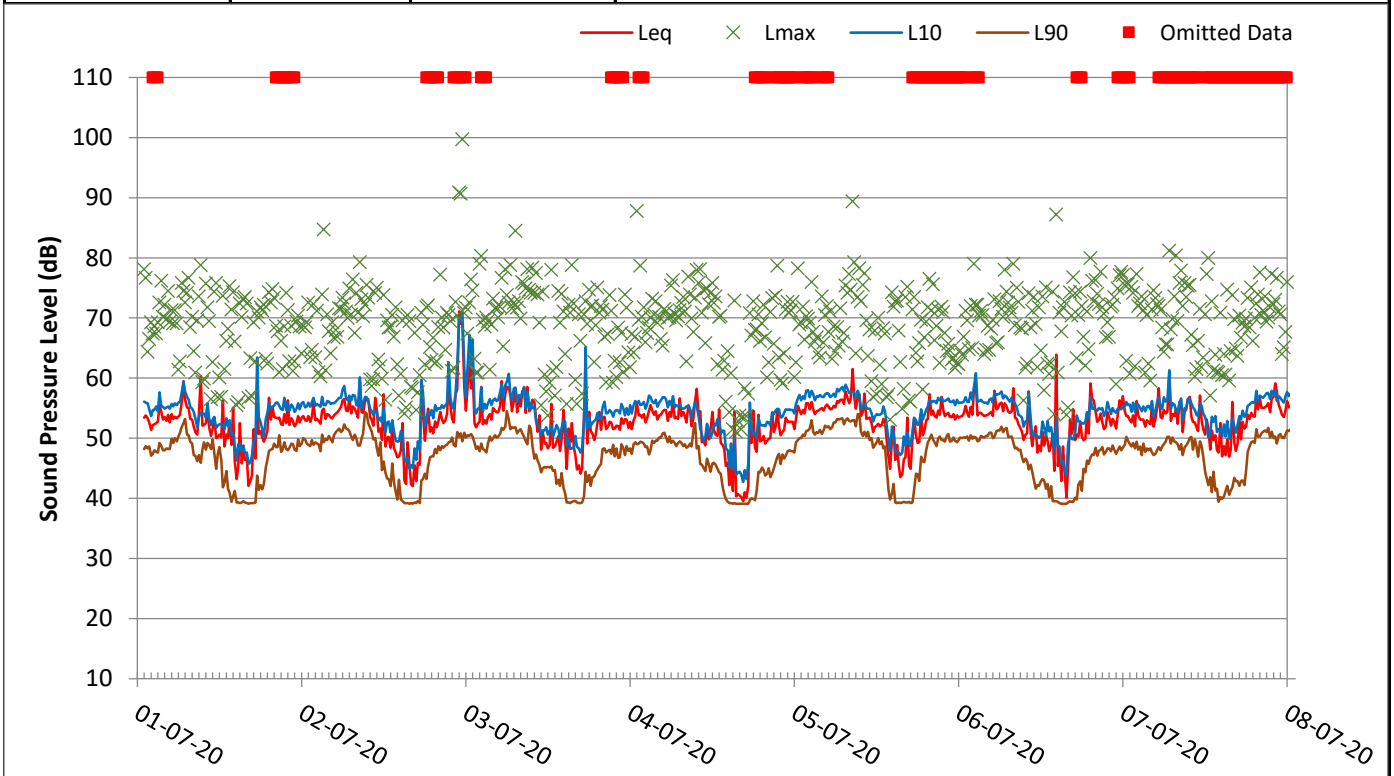
Noise Monitoring Form

Project Name:	TCDD Halkali - Cerkezkoy HS Railway	**Project No:**	70069878
Location:	LT4	**Engineer:**	Çınar Mühendislik
Equipment:		**Weather:**	Periods of high winds (>5m/s) have been omitted from the dataset.
Coordinates UTM35N	X:622422.9752 - Y:4558596.585		

Measurement Period

Date	Start / Stop Time	Measurement Intervals
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08/07/2020	12:44	

Description of Audible Noise





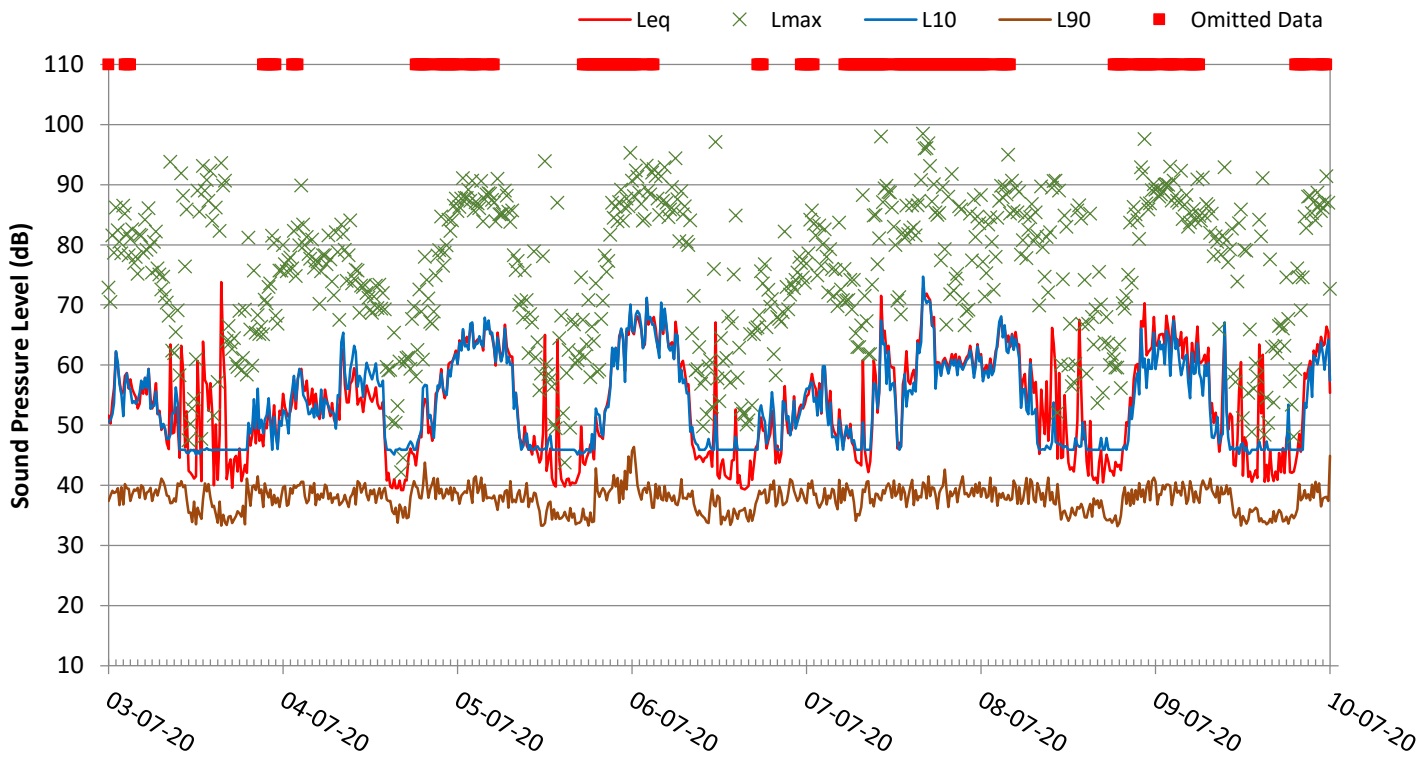
Noise Monitoring Form

Project Name:	TCDD Halkali - Cerkezkoy HS Railway	**Project No:**	70069878
Location:	LT5	**Engineer:**	Çınar Mühendislik
Equipment:		**Weather:**	Periods of high winds (>5m/s) have been omitted from the dataset.
Coordinates UTM35N	X:621137.1817 - Y:4560001.8821		

Measurement Period

Date	Start / Stop Time	Measurement Intervals
03/07/2020	11:45	15 min
10/07/2020	11:45	

Description of Audible Noise









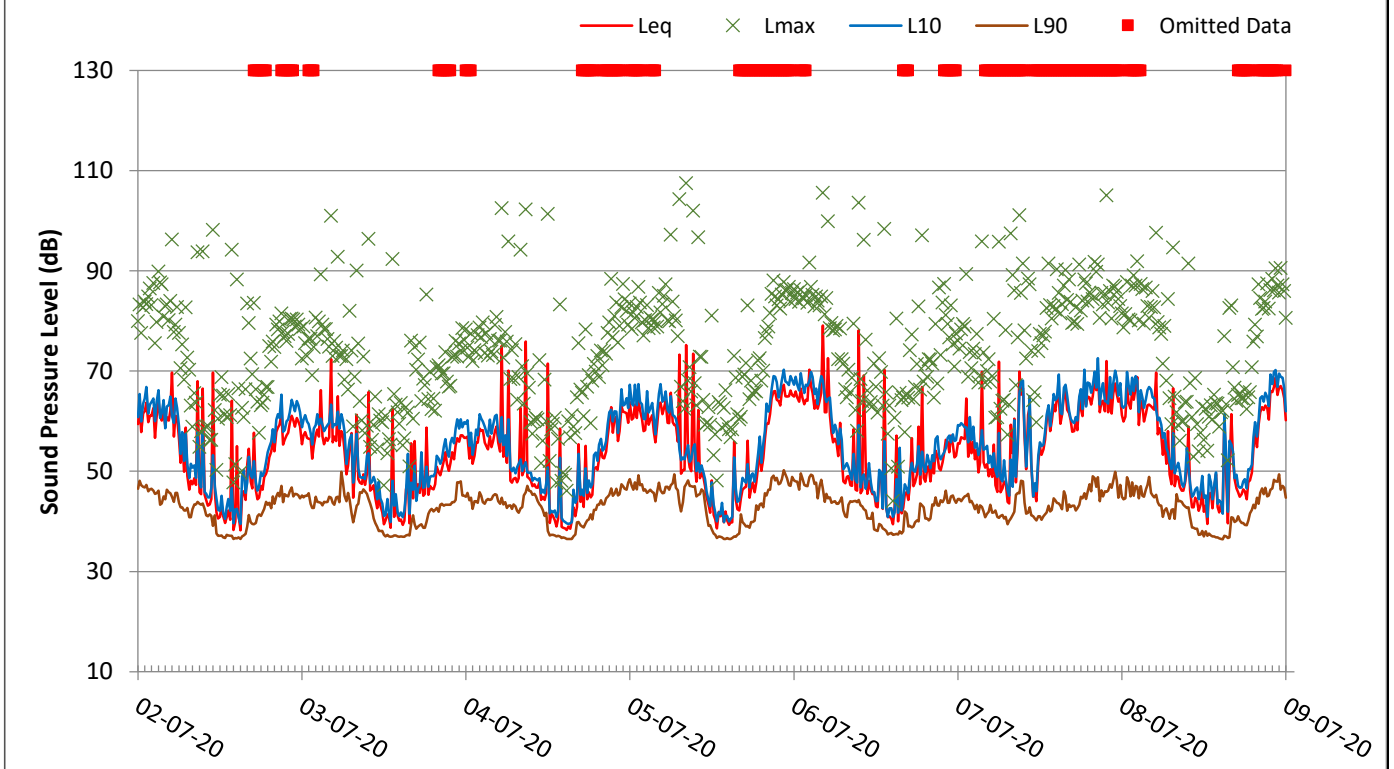
Noise Monitoring Form

Project Name:	TCDD Halkali - Cerkezkoy HS Railway	**Project No:**	70069878
Location:	LT6	**Engineer:**	Çınar Mühendislik
Equipment:		**Weather:**	Periods of high winds (>5m/s) have been omitted from the dataset.
Coordinates UTM35N	X:614266.5913 - Y:4563701.11		

Measurement Period

Date	Start / Stop Time	Measurement Intervals
02/07/2020	13:00	15 min
09/07/2020	13:00	

Description of Audible Noise







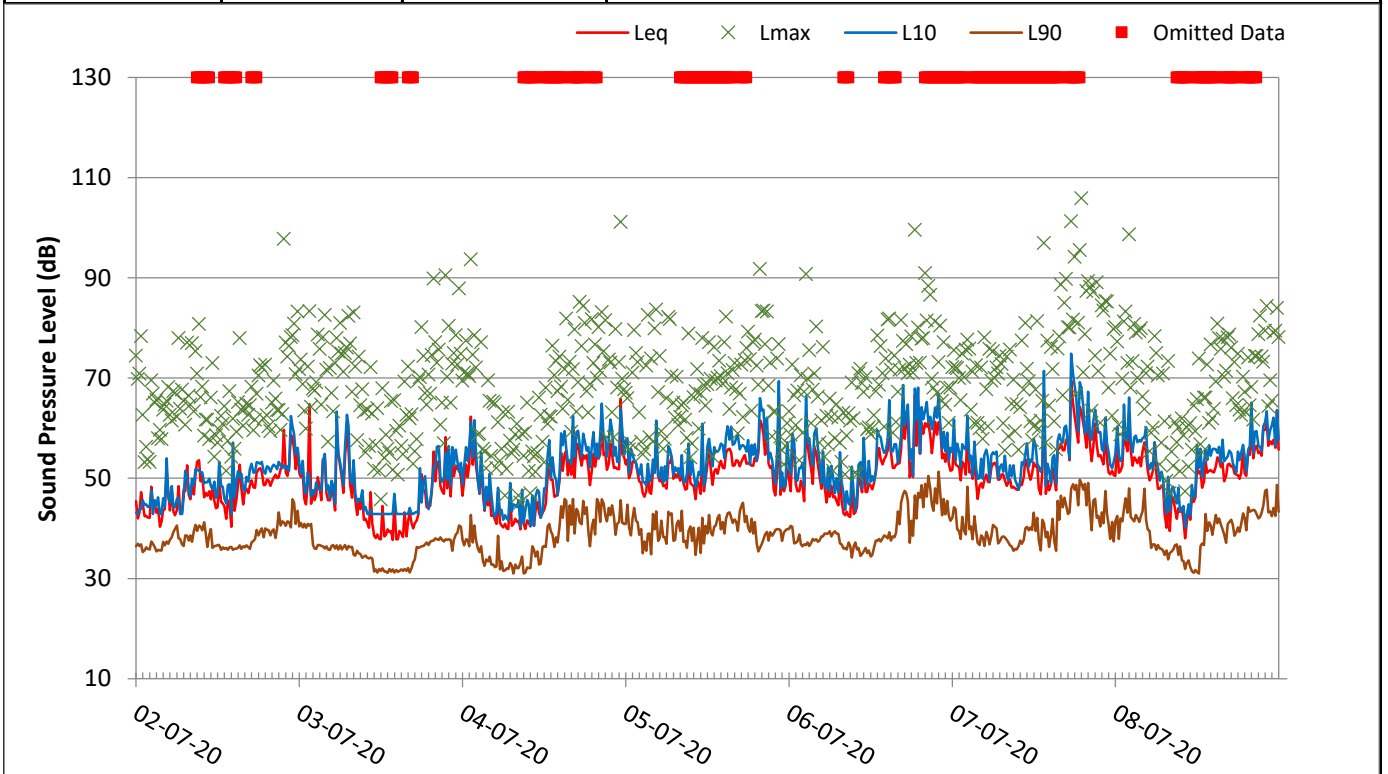
Noise Monitoring Form

Project Name:	TCDD Halkali - Cerkezkoy HS Railway	**Project No:**	70069878
Location:	LT7	**Engineer:**	Çınar Mühendislik
Equipment:		**Weather:**	Periods of high winds (>5m/s) have been omitted from the dataset.
Coordinates UTM35N	X:599871.7098 - Y:4565089.1323		

Measurement Period

Date	Start / Stop Time	Measurement Intervals
02/07/2020	21:00	15 min
09/07/2020	20:59	

Description of Audible Noise

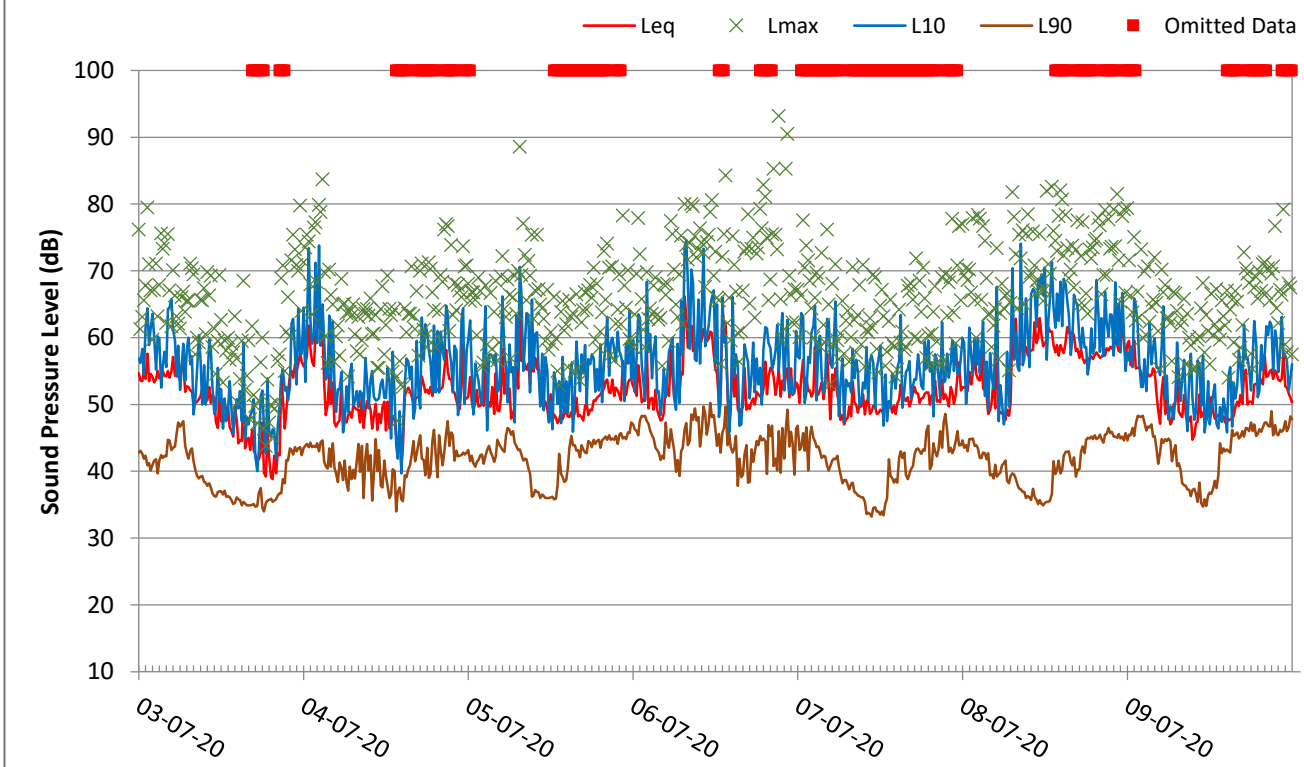




Noise Monitoring Form

Project Name:	TCDD Halkali - Cerkezkoy HS Railway	**Project No:**	70069878
Location:	LT8	**Engineer:**	Çınar Mühendislik
Equipment:		**Weather:**	Periods of high winds (>5m/s) have been omitted from the dataset.
Coordinates UTM35N	X:586992.6981 - Y:4570318.1356		

Measurement Period			**Description of Audible Noise**
Date	**Start / Stop Time**	**Measurement Intervals**	
03/07/2020 10/07/2020	16:30 16:29	15 min	







Appendix L

CRITICAL HABITAT ASSESSMENT (CHAPTER 8: ECOLOGY)

Public

AYGM

HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Critical Habitat Assessment



70069878
APRIL 2021

CONFIDENTIAL

AYGM

HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Critical Habitat Assessment

TYPE OF DOCUMENT (VERSION) CONFIDENTIAL

PROJECT NO. 70069878

OUR REF. NO. 70069878

DATE: APRIL 2021

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QUALITY CONTROL

Issue/Revision	First Issue	Revision 1	Revision 2	Revision 3
Remarks	Draft	Final	Final	Final (Revision 3)
Date				
Prepared By	J. Seller	J. Seller	J. Seller	J. Seller
Signature				
Checked By	R. Gowing C. Beard	R. Gowing C. Beard	J. Warhurst	J. Warhurst
Signature				
Authorised By	R. Bailey	R. Bailey	R. Bailey	R. Bailey
Signature				
Project Number	70069878	70069878	70069878	70069878
Report Number	Revision 0.1	Revision 1.0	Revision 2.0	Revision 3.0
File Reference	Critical Habitat Assessment			

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1 INTRODUCTION

1.1 BACKGROUND

1.1.1. The Turkish General Directorate of the Infrastructural Investment (AYGM) intents to construct a new high-speed rail between Halkali and Çerkezköy (hereafter the 'Project'), situated in the Marmara region of Turkey. The European Bank for Reconstruction and Development (EBRD) and the Asian Infrastructure Investment Bank (AIIB), collectively called the 'Lenders', are considering financing the Project. The Project has therefore been developed in accordance with the Lenders policy and requirements.

1.1.2. As part of the Project the requirement for a Critical Habitat Assessment (CHA) has been identified.

1.1.3. The Project is being developed in alignment with EBRD Performance Requirements, including Performance Requirement 6 (PR6) on Biodiversity Conservation and Sustainable Management of Living Natural Resources[1].

1.2 REPORT PURPOSE

1.2.1. This report provides an assessment of the nature and extent of Critical Habitats[2] and Priority Biodiversity Features[3] relevant to the Project (collectively, this comprises the CHA), together with an assessment of the Project proposals against the requirements of PR6. It has the following aims:

- To identify biodiversity that would qualify as Critical Habitat or a Priority Biodiversity Feature (as defined under PR6);
- Assess the implications of Critical Habitat/Priority Biodiversity Features on the Project; and
- Outline the mitigation measures required for the Project to progress in line with PR6.

1.3 EBRD PR6

1.3.1. PR6 has three specific objectives: to protect and conserve biodiversity; to maintain the benefits from ecosystem services; and to promote the sustainable management of living natural resources through the adoption of practices that integrate conversation needs and development priorities. PR6 is applied to a project based upon the perceived risks to biodiversity, ecosystem services, and natural resources, which are screened as part of the risks and impacts identification process as set out in Performance Requirement 1.

1.3.2. Features of most significant value are further classified as being Critical Habitats, and have unique criteria associated with their evaluation.

[1] EBRD. 2014. Performance Requirement 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.

[2] Under PR6, the most sensitive biodiversity features are defined as Critical Habitat (see definition in Section 2 of this report).

[3] As per PR6, Priority biodiversity features are a subset of biodiversity that is particularly irreplaceable or vulnerable, but at a lower priority level than critical habitats.

1.4 THE PROJECT

1.4.1. The Project is located between Istanbul and Çerkezköy in the Marmara region of Turkey (see **Figure 1-1** below).

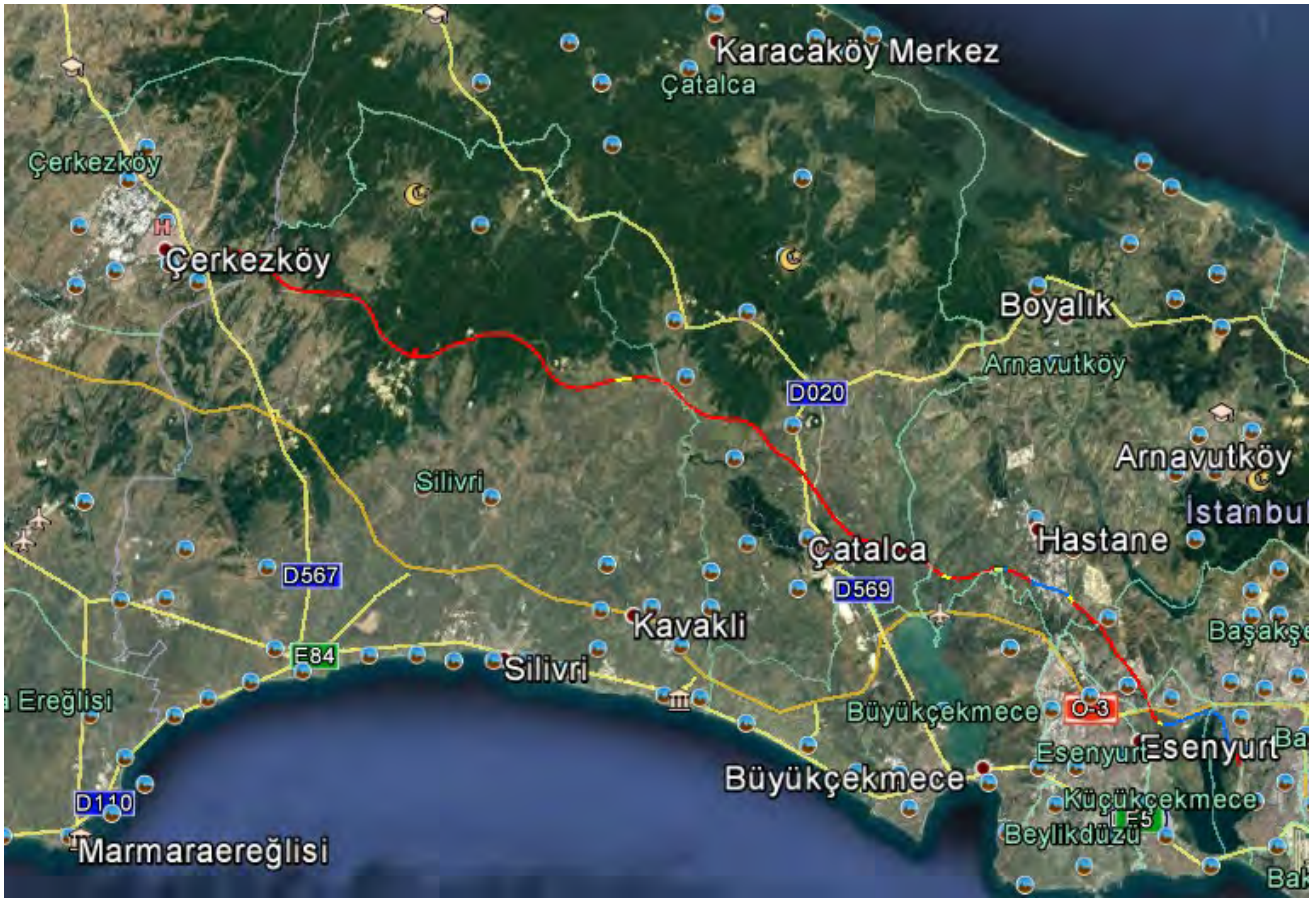


Figure 1-1 - Map showing the Projects Regional Context

1.4.2. The Project comprises the construction of a new, mainly double-track, high-speed railway line between Istanbul and Çerkezköy, approximately 85km in length. In places, the new line will run adjacent to an existing single-track railway; elsewhere the new line diverges from this existing railway. Associated structures include a number of culverts, bridges, viaducts and three new tunnels.

1.4.3. The current construction programme is due to start in 2021 and be completed in 2026.

2 METHODOLOGY

2.1 THE CRITICAL HABITAT ASSESSMENT PROCESS

2.1.1. The CHA process assesses the importance of a defined area to one or more biodiversity receptors that meet the requirements of PR6 in terms of Critical Habitat or Priority Biodiversity Features determination.

2.1.2. Determining the presence of Critical Habitat/Priority Biodiversity Features is a process that is explicitly separate from any consideration of a project's impacts, mitigation strategy, etc. The only influence of a project on the CHA process is for identification of the location and extent of the area to be assessed. This is determined by the Project's Zone of Influence (ZoI[4]).

2.1.3. To assist with the determination of Critical Habitat or Priority Biodiversity Features, the guidance and threshold criteria described within updated EBRD Guidance Note 6[5] has been followed.

2.1.4. PR6 defines two sets of criteria for use in defining Critical Habitats or Priority Biodiversity Features. These are as follows:

CRITICAL HABITAT

(i) highly threatened or unique ecosystems;

(ii) habitats of significant importance to endangered[6] or critically endangered[6] species;

(iii) habitats of significant importance to endemic or geographically restricted species;

(iv) habitats supporting globally significant migratory or congregatory species;

(v) areas associated with key evolutionary processes; or

(vi) ecological functions that are vital to maintaining the viability of the above biodiversity features.

PRIORITY BIODIVERSITY FEATURES

(i) threatened habitats;

(ii) vulnerable species;

(iii) significant biodiversity features identified by a broad set of stakeholders or governments (such as Key Biodiversity Areas or Important Bird Areas); and

[4] The ZoI is the area over which impacts from the Project could legitimately be expected to occur.

[5] EBRD. 2020. Guidance Note: EBRD Performance Requirement 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources.

[6] As per IUCN Red List of Threatened Species.

(iv) ecological structure and functions needed to maintain the viability of priority biodiversity features described above.

2.1.5. The triggering of anyone (or more) of the above will result in Critical Habitat being classified (as such, features being considered against the above criteria are referred to as potential Critical Habitat or Priority Biodiversity Feature 'triggers'). Each category also has a corresponding Priority Biodiversity Feature threshold. These thresholds are referenced within the assessment where appropriate.

STEP 1 – DEFINE THE STUDY AREA

2.1.6. Under the requirements of PR6, it is necessary for an appropriately defined area to be assessed for the presence of Critical Habitat. This is referred to in a number of ways; updated EBRD guidance makes reference to an 'ecological appropriate area of assessment' (EAAA), which is the wider distribution of a feature or receptor (often at a landscape level) within which there is connectivity between the ecological process that supports the feature or receptor. The EAAA is used throughout this report as the basis for the application of each of the criteria thresholds in order to determine Critical Habitat (or Priority Biodiversity Feature) EAAA.

2.1.7. Defining an appropriate EAAA is an important step in the CHA process as it ensures assessment of an ecologically relevant feature/area, rather than an area influenced only by the project footprint. It also has inherent appreciation of ecological function across an area, and therefore avoids the risk of considering the specific areas in which a Critical Habitat trigger may be present discontinuously or seasonally.

2.1.8. EAAAs should be identified separately for each individual biodiversity receptor being assessed during the CHA process.

STEP 2 – STAKEHOLDER CONSULTATION AND INITIAL DESKTOP REVIEW OF AVAILABLE DATA

2.1.9. Step 2 is designed to identify features that may trigger Critical Habitat – the screening process. This is done through consultation with relevant stakeholders and a review of readily available data and published literature. At this stage, use of the Integrated Biodiversity Assessment Tool (IBAT)[7] is recommended.

STEP 3 – VERIFICATION OF AVAILABLE INFORMATION

2.1.10. This includes fieldwork and engagement with relevant stakeholders/specialists.

STEP 4 – CONFIRMATION OF BIODIVERSITY

2.1.11. This comprises review of confirmed biodiversity against the Critical Habitat (and Priority Biodiversity Features) criteria.

[7] Integrated Biodiversity Assessment Tool: https://www.ibat-alliance.org/

STEP 5 – DETERMINATION OF CRITICAL HABITAT STATUS

2.1.12. This comprises concluding remarks against each EAAA regarding Critical Habitat status, based upon Steps 1-4 above.

2.2 CRITICAL HABITAT CRITERIA

2.2.1. Assessment of each biodiversity receptor against the Critical Habitat (and associated Priority Biodiversity Feature) criteria makes use of both qualitative and quantitative thresholds. These are detailed within **Table 2-1** below.

Table 2-1 - Criteria and Conditions for Identifying Priority Biodiversity Features and Critical Habitats

Criterion	Priority Biodiversity Feature	Critical Habitat
1. Priority Ecosystems		
1i *Threatened ecosystems*		
a) Habitats listed in Annex 1 of EU Habitats Directive (EU members only) or Resolution 4 of Bern Convention (signatory nations only) b) IUCN Red-List EN or CR ecosystems	a) EAAA is habitat type listed in Annex 1 of EU Habitats Directive or Resolution 4 of Bern Convention b) EAAA** < 5% of the global extent of an ecosystem type with IUCN status of CR or EN	a) EAAA is habitat type listed in Annex 1 of EU Habitats Directive marked as “priority habitat type” b) EAAA ≥5% of global extent of an ecosystem type with IUCN status of CR or EN c) EAAA is ecosystem determined to be of high priority for conservation by national systematic conservation planning
2. Priority Ecosystems		
2i *Threatened species*		
a) Species and their habitats listed in EU Habitats Directive and Birds Directive (EU members only) or Bern Convention (signatory nations only) b) IUCN Red List EN or CR species c) IUCN Red List VU species	a) EAAA for species and their habitats listed in Annex II of Habitats Directive, Annex I of Birds Directive, or Resolution 6 of Bern Convention b) EAAA supports < 0.5% of global population OR < 5 reproductive units of a CR or EN species.	a) EAAA for species and their habitats listed in Annex IV of the Habitats Directive (See EU restrictions) b) EAAA supports ≥ 0.5% of the global population AND ≥ 5 reproductive units of a CR or EN species c) EAAA supports globally significant population of VU

Criterion	Priority Biodiversity Feature	Critical Habitat
d) Nationally or regionally (e.g., Europe) listed EN or CR species	c) EAAA supports VU species d) EAAA for regularly occurring nationally or regionally listed EN or CR species	species necessary to prevent a change of IUCN Red List status to EN or CR, and satisfies threshold (b) d) EAAA for important concentrations of a nationally or regionally listed EN or CR species
2ii *Range-restricted species*		
	a) EAAA for regularly occurring range-restricted species	a) EAAA regularly holds ≥ 10% of global population AND ≥ 10 reproductive units of the species[8]
2iii *Migratory and congregatory species*		
	a) EAAA identified per Birds Directive or recognized national or international process as important for migratory birds (esp. wetlands)	a) EAAA sustains, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population at any point of the species' lifecycle b) EAAA predictably supports ≥10 percent of global population during periods of environmental stress

2.2.2. Additionally, there are three criteria for identifying Critical Habitat and Priority Biodiversity Features that have no pre-determined conditions, which require application of expert judgement beyond the scope of **Table 2-1**. These are (criterion reference for the purpose of this assessment in brackets):

- PR6 para 14(v) defines an area as Critical Habitat if it includes '*…areas associated with key evolutionary processes'* (3);

[8] The IUCN Key Biodiversity Areas standard cites the following definition for reproductive unit: "the minimum number and combination of mature individuals necessary to trigger a successful reproductive event at a site. Examples of five reproductive units include five pairs, five reproducing females in one harem, and five reproductive individuals of a plant species."

- PR6 para 12 (iii) defines Priority Biodiversity Features including '*…significant biodiversity features identified by a broad set of stakeholders or governments (such as Key Biodiversity Areas or Important Bird Areas)*' (2iv); and
- PR6 para 12(iv) defines Priority Biodiversity Features including '*…ecological structure and functions needed to maintain the viability of priority biodiversity features…*' (4).

2.3 DATA SOURCES

2.3.1. This CHA is based upon a range of data collected specifically to inform this study, as well as existing information collated from a wide range of published literature (see **Table 2-2**). Much of this has been presented within the Project Environmental and Social Impact Assessment (ESIA), which should be read alongside this report.

Table 2-2 - Inventory of Data Sources

Data Source	Relevant Organisations	Details
IBAT Report	IBAT-alliance.org	Report generated on 17th June 2020. The report identified a range of potential Critical Habitat triggers and concluded the Project was 'likely' to be within Critical Habitat.
Kanal Istanbul EIA	Produced by Cinar Engineering Consulting Co. ('Cinar')	National EIA of the proposed Kanal Istanbul project (a canal extending south-north on the west side of Istanbul), including information relevant to the east of the Project.
Wintering Bird Survey Report	Produced by Prof. Dr. Mustafa Sözen and Dr. Muhsin Çoğal (ACE Consulting). Commissioned by AIIB and EBRD.	Condensed wintering bird survey programme completed in February and March 2020 in support of the Project.
Fauna Survey Report	Produced by Prof. Dr. Mustafa Sözen	Targeted faunal surveys undertaken in February and March 2020 in support of the Project.
Vegetation / Habitat Survey Report	Produced by Prof. Dr. Hayri Duman	Targeted botanical and habitat surveys undertaken in February and March 2020 in support of the Project.
Field surveys to inform the Project ESIA	Managed by Cinar	Targeted bird and general biodiversity surveys were undertaken across the Project during June to September 2020 (inclusive).

Data Source	Relevant Organisations	Details
Project ESIA	WSP	**Chapter 8: Ecology** of the ESIA produced for this Project.
Literature review	WSP/Cinar	A detailed literature review has been undertaken in support of the biodiversity input to the Project (including specifically this CHA). Referenced where used.
e-bird	www.ebird.org	Online resource for global bird records.
Ad hoc stakeholder consultation/liaison	Turkish Birdlife Partner organisation – Doga (https://www.dogaderneği.org/)	Limited information around potential bird risks associated with the Project.

EXPERT STAKEHOLDER ENGAGEMENT

2.3.2. A vital part of the CHA process is engagement with, and ongoing involvement of, relevant external experts. The Project has had ongoing input from expert specialists, as follows:

- Prof. Dr. Hayri Duman – Department of Biology, University of Gazi. IUCN Red List Authority Co-ordinator and co-author Red Data Book of Turkish Plants;
- Dr. Levent Bilar – Biologist. Cinar;
- Nilay Ayguney – Biodiversity Consultant, Kiana Biodiversity and Environmental Consultancy;
- Okan Can – Environmental Specialist; and
- Representatives of Birdlife International (Doga – Turkish partner organisation).

2.4 LIMITATIONS

2.4.1. As a result of the developing Covid-19 situation and the global restrictions on work/travel, this study has been informed by a mix of baseline information sources that has relied more upon desk-based information than under normal circumstances. In most cases, there is an abundance of relevant existing information that has been accessed, which alongside supplementary field survey data, is considered sufficient to provide confidence in the assessments undertaken. In some cases, a more precautionary assessment has been necessary in order to ensure that the principles of PR6 are adequately applied and that the importance of any particular receptor has not been underestimated.

2.5 COMPLIANCE WITH EBRD PR6

2.5.1. The principles of PR6 seek to avoid impacts to biodiversity, and in particular impacts to biodiversity of high value. It is recognised that in some circumstances, development may be appropriate within such areas, although only when supported by robust justification and reasoned assessment.

2.5.2. Upon determination of Critical Habitat/Priority Biodiversity Features, it is necessary to review the Project's compliance with PR6. For projects located in areas containing Critical Habitat/Priority

Biodiversity Features, PR6 has a number of explicit conditions, all of which need to be met to demonstrate project compliance. These conditions are listed within **Table 2-3**.

Table 2-3 - PR6 Conditions for Working within Critical Habitat / Priority Biodiversity Features

Critical Habitat – Conditions	Priority Biodiversity Features – Conditions
No other viable alternatives within the region exist for development of the project in habitats of lesser biodiversity value.	There are no technically and economically feasible alternatives.
Stakeholders are consulted in accordance with PR10[9].	Stakeholders are consulted in accordance with PR10.
The project is permitted under applicable environmental laws, recognising the priority biodiversity features.	The project is permitted under applicable environmental laws, recognising the priority biodiversity features.
The project does not lead to measurable adverse impacts on those biodiversity features for which the critical habitat was designated.	-
The project is designed to deliver net gains for critical habitat impacted by the project.	Appropriate mitigation measures are put in place, in accordance with the mitigation hierarchy, to ensure no net loss and preferably a net gain of priority biodiversity features over the long term, to achieve measurable conservation outcomes.
The project is not anticipated to lead to a net reduction in the population of any endangered or critically endangered species, over a reasonable time period.	-
A robust and appropriately designed, long-term biodiversity monitoring and evaluation programme aimed at assessing the status of critical habitat is integrated into the client's adaptive management programme.	-

[9] EBRD. 2014. Performance Requirement 10: Information Disclosure and Stakeholder Engagement.

Critical Habitat – Conditions	Priority Biodiversity Features – Conditions
-	The overall benefits outweigh the project impacts on biodiversity.

3 CRITICAL HABITAT DETERMINATION

3.1 DETERMINING THE CANDIDATE LIST OF BIODIVERSITY RECEPTORS

3.1.1. This CHA focusses on biodiversity receptors identified during the baseline data collection process[10], which are considered to have the potential to trigger Critical Habitat or Priority Biodiversity Features, as explained in **Paragraph 2.1.5**. These biodiversity receptors are listed in **Table 3-1** together with reason for their inclusion/exclusion.

3.1.2. **Table 3-1** provides a candidate list based upon relevant published literature/information, together with the application of internationally recognised expertise, relevant to the region and prevailing habitats.

3.1.3. An assessment of Critical Habitat against each of the 'screened in' candidate species is provided within **Section 3.3** onwards.

[10] I.e. as per data sources in 2.1

Table 3-1 - Critical Habitat/Priority Biodiversity Features Screening

Biodiversity Value	Scientific Name	IUCN CR	IUCN EN	IUCN VU	Other Listing	Screening Comments	CH/PBF Criteria
Common pochard	*Aythya farina*			x		Screened in: Known wintering population at Büyükçekmece and Terkos Basin (crossed by the Project).	2i(c)
Red-breasted goose	*Branta ruficollis*			x		Screened in: Known wintering population at Büyükçekmece and Terkos Basin (crossed by the Project).	2i(c)
White-headed duck	*Oxyura leucocephala*		x			Screened in: Potential wintering/passage populations at Büyükçekmece and Küçükçekmece (crossed by the Project).	2i(b)
Eastern imperial eagle	*Aquila heliaca*			x		Screened in: Breeding species in the region. Confirmed present during 2020 surveys for the Project.	2i(c)
Greater spotted eagle	*Clanga clanga*		x*	x		Screened in: known wintering/passage birds/population at Terkos Basin (crossed by the Project).	2i(c)/(b)
Steppe eagle	*Aquila nipalensis*	x*	x			Screened out: Occasional passage visitor to the region.	-
Saker falcon	*Falco cherrug*		x			Screened out: No known breeding population in Marmara region since 1980[11].	-
Plant	*Centaurea hermannii*				EN(T)	Screened in: Confirmed present during 2020 surveys for the Project.	2i(d), 2ii
Plant	*Cirsium polycephalum*				CR(T)	Screened in: Confirmed present during 2020 surveys for the Project.	2i(d), 2ii
Plant	*Crocus pestalozzae*				VU(T)	Screened in: Confirmed present during 2020 surveys for the Project.	2ii
Plant	*Crocus olivieri* subsp. *Istanbulensis*				EN(T)	Screened in: Confirmed present during 2020 surveys fir the Project.	2i(d), 2ii
Plant	*Galanthus x valentine*				VU(T)	Screened in: Confirmed present during 2020 surveys.	2ii
Plant	*Amblyopyrum muticum*		x			Screened out: Not recorded during 2020 surveys for the Project. Not known from vicinity of the Project; only described within the Anatolia region (Brehm, 2017[12]).	-
Plant	*Lathyrus undulatus*		x			Screened in: Considered likely to be present[13].	2i(d), 2ii
Beetle	*Osmoderma lassallei*		x			Screened out: Not known from vicinity of the Project - closest record approximately 75km to the south as per Avgin *et al.* (2014[14]).	-
Big-bellied glandular bush-cricket	*Bradyporus macrogaster*		x			Screened out: Not known from vicinity of the Project (as per Unal, 2011[15]); only known record approximately 50km west of the Project.	-

[11] Dixona, A., Ragyovb, D., Ayasc, D., Delic, M., Demerdzhievd, D., Angelove, I., Kmetovaf, E. and Nedko Nedyalkovg. 2009. Population status of breeding Saker Falcons (Falco cherrug) in Turkey. Avian Biology Research **2** (4): 213-220.

[12] Magos Brehm, J. 2017. *Amblyopyrum muticum*. *The IUCN Red List of Threatened Species* 2017: e.T110434565A110434568. https://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T110434565A110434568.en. Downloaded on 23 July 2020.

[13] Prof. Duman. Pers. comm.

[14] Avgın, S. S., & Dertli, I. & Barševskis, A. (2014). A review of Turkish saproxylic beetles from the European Red List. Annales de la Société entomologique de France (N.S.). 50. 10.1080/00379271.2014.896099.

15 Ünal, M. (2011). Taxonomic review of the subfamily Bradyporinae (Orthoptera: Tettigoniidae; Bradyporini; Ephippigerini) of Turkey, with description of new species and the relationship of the taxa. Zootaxa. 2899. 1-42. 10.11646/zootaxa.2899.1.1.

Biodiversity Value	Scientific Name	IUCN CR	IUCN EN	IUCN VU	Other Listing	Screening Comments	CH/PBF Criteria
Fungi	*Fomitopsis officinalis*		x			Screened out: Lack of suitable habitat (and tree species – the species relies solely on larch *Larix* sp., which were not recorded from the ZoI).	
Long-fingered bat	*Myotis capaccinii*			x		Screened in: The species is considered to be present across the region[16], with suitable habitat present for its feeding and roost sites.	2i(a)
Greater noctule bat	*Nyctalus lasiopterus*			x		Screened out: No known records from the vicinity of the Project as per Paksuz & Ozkan (2011).	-
Bats (general)	-				AII/R6	Screened in: A further number of bat species (up to 25) are potentially present across the ZoI with the habitat assemblage suitable for roosting and foraging for a number of species,	2i(a)
European ground squirrel	*Spermophilus citellus*		x			Screened in: Recorded during 2020 surveys	2(b)
Marbled polecat	*Vormela peregusna*			x		Screened in: Known regional presence[17]; suitable habitat present across the Project.	2(c)
Mediterranean spur-thighed tortoise	*Testudo graeca*			x		Screened in: Recorded during 2020 surveys for the Project.	2i(c)
Russian sturgeon and Beluga sturgeon *Huso huso*	*Acipenser gueldenstaedti* and *Huso huso*	x				Screened in: Known to be historically present in Küçükçekmece Basin.	2i(b)
EU Habitats Directive Annex II/IV species					AII/IV	Screened out: Aside from those species mentioned individually above, species listed on Annex II/IV of the EU Habitats Directive (not listed as Threatened on the IUCN Red List) are considered occasionally present across the ZoI and beyond but not the extent that would indicate a core range or area of relative importance for the species.	-
Büyükçekmece Lake Important Bird Area (IBA)						Screened in: Crossed by the Project.	2iii
Küçükçekmece Basin IBA						Screened in: Crossed by the Project.	2iii
Terkos Basin IBA and KBA						Screened in: Crossed by the Project.	2iii, 4
Meso- and eutrophic Quercus, Carpinus, Fraxinus, Acer, Tilia, Ulmus and related woodland					AI	Screened in: Recorded at various locations across the Project ZoI.	1i(a)

x* denotes inclusion on the regional IUCN list at a different level.

(T) denotes inclusion within Red List of Turkey

AI/II/IV – aligns with EU Habitats Directive Annex I habitat/Annex II species/Annex IV species

R6 - species listed on Resolution 6 of the Bern Convention

[16] E.g. as per the species' IUCN assessment: Paunović, M. 2016. *Myotis capaccinii*. The IUCN Red List of Threatened Species 2016: e.T14126A22054131.

[17] E.g. as per the species' IUCN assessment: Abramov, A.V., Kranz, A. & Maran, T. 2016. *Vormela peregusna*. The IUCN Red List of Threatened Species 2016: e.T29680A45203971.

3.2 DETERMINING THE EAAA

3.2.1. Determining the EAAA varies depending on the biodiversity receptor. In the case of protected areas and those species associated with these areas, the EAAA extends to the protected area boundary. For other species, the extent of the EAAA has been influenced by factors such as known range/distribution (where available), prevailing habitat types and land uses and with the application of expert opinion where considered appropriate. In some instances, a necessarily broad and conservative EAAA has been estimated, where there is a lack of detailed understanding of distribution together with the species' generalist nature (e.g. marbled polecat).

3.2.2. The EAAA for each biodiversity receptor is described in **Section 3.3** and illustrated within Appendix A.

3.2.3. For some species it is appropriate to consider separate EAAAs (for a single species) rather than aggregating them. This has been done where the habitats/landscape between them are markedly different and where aggregating EAAAs would result in erroneous conclusions potentially being drawn regarding parts of the Project's importance to a Critical Habitat/Priority Biodiversity Feature trigger. An example of this approach is with waterbirds which are naturally restricted to wetland areas, with generally negligible use for the land in between.

3.3 CRITERION 1 – PRIORITY ECOSYSTEMS

3.3.1. There is one biodiversity receptor which may trigger Critical Habitat or Priority Biodiversity Feature under Criterion 1. This is discussed below.

1i. Threatened Ecosystems

Table 3-2 - Meso- And Eutrophic Quercus, Carpinus, Fraxinus, Acer, Tilia, Ulmus and Related Woodland

Factor	Description
Receptor Conservation Status	**EU Habitats Directive Annex I Habitat: 9170 Galio-carpinetum oak-hornbeam forests.**
Receptor EAAA	The EAAAs for this receptor comprises the continuous extents of his habitat from those recorded within the ZoI, illustrated on Figure A-1 for reference.
Assessment	This habitat is considered to be 'threatened' by virtue of its inclusion on Annex I of the EU Habitats Directive; this denotes that the habitat is in need of conservation at a European level. The habitat is not considered a priority habitat under this Directive (i.e. a habitat in danger of disappearance). Given the above, it is not considered that this habitat represents an area *'…determined to be of high priority for conservation by regional or national systematic conservation planning.'.* **The EAAA is therefore not considered of sufficient value for it to qualify as Critical Habitat under Criterion 1 for this habitat type.**

Factor	Description
	Given its threatened status, **the EAAA is considered of sufficient value for it to qualify as Priority Biodiversity Feature under Criterion 1 for this habitat type.**

3.4 CRITERION 2 – PRIORITY SPECIES AND THEIR HABITATS

Criterion 2i. Threatened Species

3.4.1. There are 13 biodiversity receptors which may trigger Critical Habitat or Priority Biodiversity Feature under Criterion 2i. These are discussed individually below.

Table 3-3 - Common Pochard

Factor	Description
Species Conservation Status[18]	**IUCN Vulnerable**
Species EAAA	The EAAAs for this species comprise the Büyükçekmece Lake, Küçükçekmece Basin and Terkos Basin. See Figure A-2.
Population Estimate in EAAA	Büyükçekmece Lake: 14036[19] Küçükçekmece Basin: 7338[20] Terkos Basin: 2225[21] Total: 23599

[18] Global and regional status listed separately if there is variance.

[19] BirdLife International (2020) Important Bird Areas factsheet: Büyükçekmece Lake. Downloaded from http://www.birdlife.org on 17/08/2020.

[20] Listed IBA population: BirdLife International (2020) Important Bird Areas factsheet: Küçükçekmece Basin. Downloaded from http://www.birdlife.org on 17/08/2020.

[21] Listed IBA population: BirdLife International (2020) Important Bird Areas factsheet: Terkos Basin. Downloaded from http://www.birdlife.org on 17/08/2020.

Factor	Description
Global Population and Trend[22]	1,950,000 (lower range estimate) and decreasing.
Assessment	The EAAAs support approximately 1.2% of the global overwintering population (based on the IBA designated population; given the age of these estimates and the lower recent counts at the site[23] it is likely that the relative figure has fallen with lower counts for the species recorded over more recent years). The EAAAs do not support a population large enough that their loss would result in the Red List status changing to Endangered (based on IUCN, 2019[24]). The species does not appear on any regional or national lists. **The EAAA is therefore not considered of sufficient value for it to qualify as Critical Habitat under Criterion 2 for common pochard.** **Given its IUCN VU status the EAAA is considered of sufficient value for it to qualify as a Priority Biodiversity Feature under Criterion 2i(c) for common pochard.**

Table 3-4 - Red-Breasted Goose

Factor	Description
Species Conservation Status	**IUCN Vulnerable (European population Near Threatened)**
Species EAAA	The EAAAs for this species comprise the Büyükçekmece Lake, Küçükçekmece Basin and Terkos Basin. See Figure A-2.

[22] BirdLife International. 2019. *Aythya ferina* (amended version of 2017 assessment). The IUCN Red List of Threatened Species 2019: e.T22680358A155473754. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T22680358A155473754.en. Downloaded on 14 August 2020.

[23] E.g. from the Mid-winter Waterbird Counts (MWC).

[24] IUCN Standards and Petitions Committee. 2019. Guidelines for Using the IUCN Red List Categories and Criteria. Version 14. Prepared by the Standards and Petitions Committee. Downloadable from http://www.iucnredlist.org/documents/RedListGuidelines.pdf

Factor	Description
Population Estimate	Büyükçekmece Lake: 80[25,19] Küçükçekmece Basin: 0 Terkos Basin: 90[21] TOTAL: 170
Global Population and Trend[26]	44,000 (lower range estimate) and decreasing.
Assessment	The EAAAs comprise approximately 0.3% of the global population. This proportion of the is not large enough that their loss would result in the Red List status changing to Endangered (based on IUCN, 2019[24]). Tthe species does not appear on any regional or national lists. **The EAAA is therefore not considered of sufficient value for it to qualify as Critical Habitat under Criterion 2 for red-breasted goose.** **Given it's IUCN VU status the EAAA is considered of sufficient value for it to qualify as a Priority Biodiversity Feature under Criterion 2i(c) for red-breasted goose.**

Table 3-5 - White-Headed Duck

Factor	Description
Species Conservation Status	**IUCN Endangered**
Species EAAA	The EAAAs for this species comprise the Büyükçekmece Lake and Küçükçekmece Basin. See Figure A-3.

[25] A single count of 340 birds was made in 2006, although since this, the maximum count has been of four birds. The IBA qualifying population number is therefore retained for the purposes of this assessment.

[26] BirdLife International. 2017. *Branta ruficollis* (amended version of 2017 assessment). *The IUCN Red List of Threatened Species* 2017: e.T22679954A118577901. https://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T22679954A118577901.en. Downloaded on 17 August 2020.

Factor	Description
Population Estimate	Unknown. Average peak count estimates below based on a crude average of e-bird records (from 1993-2019). Büyükçekmece Lake: 10 Küçükçekmece Basin: 10 TOTAL: 20
Global Population and Trend[27]	5300 (lower range estimate) and decreasing.
Assessment	Populations across the Büyükçekmece Lake and Küçükçekmece Basin have averaged less than three birds (combined) since beginning of MWC records in 1993, which is approximately0.06% of the global population; however, there have been two individual years where numbers at one of the wetlands would have met the threshold for triggering Critical Habitat – 42 birds (approximately 0.8% of the global population) at Büyükçekmece Lake in 2017 and 36 birds (approximately 0.7% of the global population) at Küçükçekmece Basin in 2006. Given the continued decline of the species and the potential for the EAAAs (both individually and collectively) to support a population that exceeds the 0.5% of global population size threshold, a precautionary assessment is considered appropriate here. **As such it is concluded that the EAAAs (specifically, Büyükçekmece Lake and Küçükçekmece Basin) are of sufficient value to qualify as Critical Habitat under Criterion 2 for white-headed duck.**

Table 3-6 - Eastern Imperial Eagle

Factor	Description
Species Conservation Status	**IUCN Vulnerable**

[27] BirdLife International. 2017. *Oxyura leucocephala*. *The IUCN Red List of Threatened Species* 2017: e.T22679814A119403602. https://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T22679814A119403602.en. Downloaded on 17 August 2020.

Factor	Description
Species EAAA	The species occupies lowland habitats including steppe, agricultural and wooded areas. As such, a limited EAAA for this species is difficult to define with much accuracy. For the purposes of this assessment the EAAA extends across uninhabited areas to the west of the D569 road between Çatalca and Gökçeali, to the outskirts of Cerkezkoy. See Figure A-4.
Population Estimate	A likely territory was identified during surveys undertaken in June 2020, with immature birds observed to the west of Çatalca (see Figure B-1). This was corroborated through consultation with Doga. The wider Thrace region (including Bulgarian extents) is thought to support over 44 pairs[28] and given relative habitat suitability and a territory size of approximately 7km, a precautionary estimate is made regarding the EAAA population size. TOTAL: 3 pairs
Global Population and Trend[29]	2,500 (lower range estimate) and decreasing.
Assessment	The EAAAs comprise approximately 0.2% of the global population (as a precautionary estimate). This proportion of the population does not meet the threshold for Critical Habitat Criterion 2(a). Furthermore, the EAAAs do not support a population large enough that their loss would result in the Red List status changing to Endangered (based on IUCN, 2019[24]). Finally, the species does not appear on any regional or national lists. Given the scarcity and decreasing global population trend of the species, the EAAAs are precautionarily considered to satisfy the overall requirement for classification as Priority Biodiversity Features under GN6 para 3.6. **The EAAA is not considered of sufficient value for it to qualify as Critical Habitat under Criterion 2 for imperial eagle.** **The EAAA is considered of sufficient value for it to qualify as a Priority Biodiversity Feature for imperial eagle.**

[28] Taken from https://www.dogadernegi.org/en/eastern-imperial-eagle/

[29] BirdLife International. 2019. *Aquila heliaca* (amended version of 2017 assessment). *The IUCN Red List of Threatened Species* 2019: e.T22696048A155464885. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T22696048A155464885.en. Downloaded on 17 August 2020.

Table 3-7 - Greater Spotted Eagle

Factor	Description
Species Conservation Status	**IUCN Vulnerable (European population IUCN Endangered)**
Species EAAA	The EAAA for this species is the Terkos Basin, which is the only known over-wintering location of the species in the region. See Figure A-5.
Population Estimate	The Terkos Basin overwintering population has not been well studied; published literature describes at least two individuals as having been recorded[30], while there are e-bird records of single birds until as recently as January 2020. A precautionary number of five birds is assessed on this basis. **Total: 5**
Global Population and Trend	2,500 (lower range estimate) and decreasing.
Assessment	The EAAA comprises approximately 0.2% of the global population (as a precautionary estimate). This proportion of the population does not meet the threshold for Critical Habitat Criterion 2(a). Furthermore, the EAAAs do not support a population large enough that their loss would result in the Red List status changing to Endangered (based on IUCN, 2019[24]). Finally, the species does not appear on any regional or national lists. Given the scarcity and decreasing global population trend of the species, the EAAAs are precautionarily considered to satisfy the overall requirement for classification as Priority Biodiversity Features under GN6 para 3.6. **The EAAA is not considered of sufficient value for it to qualify as Critical Habitat under Criterion 2 for greater spotted eagle.** **The EAAA is considered of sufficient value for it to qualify as a Priority Biodiversity Feature for greater spotted eagle.**

[30] Per, E., Ulusoy, E. and Vural, D. 2018. An unusual record of greater spotted eagle (*Clanga clanga*) in winter in Ankara, Turkey. Commagene Journal of Biology **2** (1): 30-33.

Table 3-8 - Long-Fingered Bat

Factor	Description
Species Conservation Status	**IUCN Vulnerable**
Species EAAA	The EAAA for this species comprises a 10km radial area around Gokceali, which reflects the average foraging distance limit (as per Almenar *et al.,* 2009[31]), around the only known roost site within the Project ZoI. See Figure A-6.
Population Estimate	60 individuals (the maximum roost count for the Gokceali roost).
Global Population and Trend[32]	Unknown, approximately 75,000 and declining.
Assessment	The EAAA comprises approximately 0.08% of the global population (as a precautionary estimate) and therefore does not support a population large enough that their loss would result in the Red List status changing to Endangered (based on IUCN, 2019[24]). The species does not appear on any regional or national lists. **The EAAA is therefore not considered of sufficient value for it to qualify as Critical Habitat** **Given the species' EU Habitats Directive Annex II status, the EAAA is considered of sufficient value for it to qualify as Priority Biodiversity Features under Criterion 2i(a) for long-fingered bat.**

Table 3-9 – Bats (general)

Factor	Description
Species Conservation Status	There are 25 species of bat potentially present across the ZoI (excluding long-fingered bat and greater noctule), all of which are

[31] Almenar, D., Aihartza, J., Goiti, U., Salsamendi, E. & Garin, I. 2009. Foraging behaviour of the long-fingered bat Myotis capaccinii: implications for conservation and management. Endangered Species Research, Vol. 8: 69-78.

[32] Paunović, M. 2016. *Myotis capaccinii. The IUCN Red List of Threatened Species* 2016: e.T14126A22054131. https://dx.doi.org/10.2305/IUCN.UK.2016-2.RLTS.T14126A22054131.en. Downloaded on 17 August 2020.

Factor	Description
	either listed on **Annex II EU Habitats Directive** or **Resolution 6 of the Bern Convention**.
Species EAAA	Bats will likely make use of large parts of the ZoI for foraging purposes. Furthermore, the animals will make use of mature woodland and buildings (as well as cave systems as per long-fingered bat for roosting). No roosts have been identified although there have not been detailed roost surveys undertaken across the full ZoI. For the purposes of this assessment, a representative EAAA is considered appropriate, extending across mature woodland mosaic in the west of the ZoI (and beyond) given the likelihood that this represents optimal foraging and roosting habitat. See Figure A-1.
Population Estimate	Unknown.
Global Population and Trend	Unknown.
Assessment	**Given bats' EU Habitats Directive Annex II/Bern Convention Resolution 6 status, the EAAA is considered of sufficient value for it to qualify as Priority Biodiversity Features under Criterion 2i(a) for bats.**

Table 3-10 - European Ground Squirrel

Factor	Description
Species Conservation Status	**IUCN Endangered**
Species EAAA	The EAAA for this species extends open steppe and grassland/agricultural land in the west of the ZoI where the species is considered potentially present. See Figure A-7.
Population Estimate	250 (see assessment below).

Factor	Description
Global Population and Trend	75,000 and decreasing[33].
Assessment	This species is found in locations across central and south-eastern Europe. The total population is unknown; however, data from in-country studies provides a precautionary (lower end) estimate of between 75,000 animals. A general decline across its range in the region is thought to be due to the loss of preferred steppe habitat[34]. Potential presence was observed from two sample points (see Figure B-2) and it is considered that the prevailing habitat, although sub-optimal, may support a population of up to 250 animals (based upon a steppe habitat population density estimate of nine animals per hectare[35] and in recognition of the limited/fragmented nature of the steppe habitat within the EAAA). This would represent approximately 0.3% of the global population (upper estimate) within the EAAA. This proportion of the population does not meet the threshold for Critical Habitat Criterion 2. **The EAAA is not considered of sufficient value for it to qualify as Critical Habitat under Criterion 2 for European ground squirrel.** **The EAAA is considered of sufficient value for it to qualify as a Priority Biodiversity Feature for European ground squirrel.**

Table 3-11 - Marbled Polecat

Factor	Description
Species Conservation Status	**IUCN Vulnerable**

[33] In the absence of any published global population estimates, a conservative, aggregated estimate is given based upon text in: Hutterer, R., Kryštufek, B., Yigit, N. & Mitsain, G. 2010. *Spermophilus citellus*. *The IUCN Red List of Threatened Species* 2010: e.T20472A9203833. Downloaded on 17 August 2020.

[34] Prof. Sozen pers. comm.

[35] Turrini, T. A., Brenner, M., Millesi, E. & Hoffman, I. E. 2008. Home ranges of European Ground Squirrels (*Spermophilus citellus*) in two habitats exposed to different degrees of human impact.

Factor	Description
Species EAAA	No records of the species exist for the ZoI. Given its preference for open habitats and known relatively general ecology in this regard, the EAAA is broadly considered to extend across all non-wooded areas outside of built-up areas, limited to the ZoI[36]. See Figure A-8.
Population Estimate	Unknown.
Global Population and Trend	Unknown. Decreasing[34].
Assessment	The marbled polecat has a large range but appears naturally rare across this range. There is very little published information regarding the species' global population and the numbers in Turkey are unknown, although the Thrace region is considered to be a relative stronghold[34]. It occurs across many open, dry habitats and there is evidence that this extends to cultivated habitats; the loss/fragmentation of steppe habitat is thought to the main reason for its continued decline[34]. No marbled polecats were observed during surveys; however, the habitat is considered suitable to support a population across much of the ZoI where more open habitats prevail (excluding the built-up areas). In the absence of any evidence which suggests habitats across the ZoI are of elevated importance to the species and represent an insignificant proportion of the regional potential habitat resource for this species, it is considered that the EAAA does not trigger Critical Habitat under Criterion 2. **Given it's IUCN VU status the EAAA is considered of sufficient value for it to qualify as a Priority Biodiversity Feature under Criterion 2i(c) for marbled polecat.**

[36] Given the lack of useful landscape/management boundaries relevant to this species, making use of the ZoI limits to define the EAAA is considered appropriate here.

Table 3-12 - Spur-Thighed Tortoise

Factor	Description
Species Conservation status	**IUCN Vulnerable**
Species EAAA	Scattered confirmed and anecdotal records of the species exist for the ZoI, including records from around the Terkos Basin. Given its preference for open and scrubby habitats, the EAAA is broadly considered to extend across all non-wooded areas outside of built-up areas (as per marbled polecat), limited to the ZoI[36]. See Figure A-8.
Population Estimate	Unknown.
Global Population and Trend[38]	Unknown. Aggregated estimate of >10 million based upon country profiles (see Assessment below). Decreasing.
Assessment	The species has fairly extensive (albeit patchy) distribution across north Africa, southern Europe and into Asia. Population information for the species is unclear, most likely because of the relative confusion over the number sub-species and therefore difficulty in attributing numbers to a particular sub-species. However, given the Bulgarian population is considered to be in excess of 2 million individuals[37], it can be assumed that a comparable population size exists in Turkey, given similar habitat availability. Four individuals of this species were recorded from transects 4 and 5 during July 2020 surveys (see Figure B-3), which aligns with general habitat suitability for the species across the west of the ZoI. Anecdotal records of the species were also collected for this area. There is no indication that the EAAAs support a significant population of the species that would trigger Critical Habitat or Priority Biodiversity Feature classification and it has been noted that regions outwith Marmara (in particular Anatolia) support more significant populations of this species[34]. **The EAAA is therefore not considered of sufficient value for it to qualify as Critical Habitat under Criterion 2 for spur-thighed tortoise.**

[37] Modelled estimate from 'Preparation of Bulgarian NGOs for the Biogeographocal Seminars, a Cornerstone of the Naura 2000 Designation Process, taken from Denkstatt. (2014). Biodiversity Action Plan for the Hermann Tortoise (*Testudo hermanni*) and the spur-thighed tortoise (*Testudo graeca*) at Ada Tepe Project area. Accessed at: https://s21.q4cdn.com/589145389/files/doc_documents/EN/2017/12/BAP_-EN.pdf

Factor	Description
	Given its IUCN VU status the EAAA is considered of sufficient value for it to qualify as a Priority Biodiversity Feature under Criterion 2i(c) for spur-thighed tortoise.

Table 3-13 - *Crocus Olivieri Subsp. Istanbulensis*

Factor	Description
Species Conservation Status	**IUCN Data Deficient (DD)** **Red Data Book of Turkish Plants[38] Endangered**
Species EAAA	This species appears to favour open woodland and scrub habitat and was recorded from the F5.4 EUNIS habitat type (*Sparticum junceum* fields) (see Figure B-4). With this in mind, it is considered appropriate (in the absence of any more defined areas) to identify a EAAA which extends across G1.A (oak/hornbeam woodland) and F5.4 EUNIS habitat types. See Figure A-9.
Population Estimate[39]	Approximately 100.
Global Population and Trend[39]	Approximately 20,000; trend unknown.
Assessment	The ZoI population of this species is thought to number approximately 100 plants, which represents 0.5% of the global population of this species. This is not considered of sufficient relative importance to qualify the EAAA as Critical Habitat. **The EAAA is therefore not considered of sufficient value for it to qualify as Critical Habitat under Criterion 2 for *Crocus olivieri* subsp. *Istanbulensis.*** **Given its status as a regularly occurring range-restricted species, the EAAA qualifies under Criterion 2i(d) as Priority Biodiversity Feature for *Crocus olivieri* subsp. *Istanbulensis.***

[38] Based upon: Ekim, T., Koyuncu, M., Vural, M., Duman, H., Aytac, Z. & Adiguzel, N. (2000). *Red Data Book of Turkish Plants (Pterdophyta and Spermatophyta).* Van : Turkiye Tabiatini Koruma Dernegi

[39] Duman, Prof Dr. H. 2020. Halkali-Cerkezköy High Speed Rail Project Flora and Vegetation.

Table 3-14 - *Centaurea hermannii*

Factor	Description
Species Conservation Status	**IUCN DD** **Red Data Book of Turkish Plants[38] Endangered**
Species EAAA	The *Centaurea* genus is associated with a broad range of habitat types; however, this species has specific habitat preferences, determined largely by soil chemistry and within the ZoI seemingly limited to the natural woodland areas (see Figure B-5). With this in mind, the species EAAA extends across the G1.A EUNIS habitat, oak and hornbeam-dominated woodland and scrub mosaic. See Figure A-1.
Population Estimate[39]	Approximately 100.
Global Population and Trend[39]	Approximately 5,000; trend unknown.
Assessment	The EAAA population of this species is thought to number approximately 100 plants, which represents up to 2% of the global population of this species. This represents an important concentration of this species within the context of Criterion 2. **The EAAA is therefore considered of sufficient value for it to qualify as Critical Habitat under Criterion 2 for *Centaurea hermannii.***

Table 3-15 - *Cirsium Polycephalum (Syn. Byzanitnyum)*

Factor	Description
Species Conservation Status	**IUCN DD** **Red Data Book of Turkish Plants[38] Critically Endangered**
Species EAAA	This species appears to favour open woodland and scrub habitat and was recorded from the G1.A and F5.4 EUNIS habitat types (oak/hornbeam woodland and *Sparticum junceum* fields, respectively) (see Figure B-6). With this in mind it is considered appropriate (in the absence of any more defined areas) to identify a EAAA which extends across these two habitat types within the ZoI (as per *Crocus olivieri* subsp. *Istanbulensis*). See Figure A-9.
Population Estimate[39]	100.

Factor	Description
Global Population and Trend[39]	Approximately 20,000; trend unknown.
Assessment	The EAAA population of this species is thought to number approximately 100 plants, which represents 0.5% of the global population of this species. This is not considered of sufficient relative importance to qualify the EAAA as Critical Habitat. **The EAAA is therefore not considered of sufficient value for it to qualify as Critical Habitat under Criterion 2 for *Cirsium polycephalum.*** **Given its status as a regularly occurring nationally listed CR species, the EAAA qualifies under Criterion 2i(d) as Priority Biodiversity Feature for *Cirsium polycephalum.***

Table 3-16 - *Lathyrus Undulatum*

Factor	Description
Species Conservation Status	**IUCN Endangered**
Species EAAA	This species appears to favour open scrub habitat and stony habitats on hillsides together with anthropogenic environments, such as roadsides (Shehadeh et al. in prep in Rowe *et al.* 2019[40]). Given the above, and the apparent similarity in habitat preferences with *Crocus olivieri* subsp. *Istanbulensis*), the EAAAs for this species comprise G1.A and F5.4 EUNIS habitat types (oak/hornbeam woodland and *Sparticum junceum* fields, respectively). See Figure A-9.
Population Estimate	100 (see Assessment below).
Global Population and Trend	Unknown. Decreasing.

[40] Rowe, J., Shehadeh, A. & Maxted, N. 2019. *Lathyrus undulatus*. *The IUCN Red List of Threatened Species* 2019: e.T176595A19405199. https://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T176595A19405199.en. Downloaded on 23 July 2020.

Factor	Description
Assessment	No individuals have been recorded during surveys (both from March and July 2020). Although it is assumed to potentially still be present on a precautionary basis (and given that some survey effort - February/March surveys – was undertaken during a sub-optimal time for recording plants). Given that no plants were identified during July surveys (the plant will have been bearing fruit and readily identifiable at this time), the number of individuals across the EAAAs is likely to be limited. When considering the numbers of other rare plants identified during surveys, and the similar habitat characteristics of this species, a conservative estimate of up to 100 plants is considered appropriate. There is no reliable estimate as to a total number of individuals across the species' AOO[41], and so it is considered appropriate to assess the species within the context of its AOO at both EAAA and global range level (to ascertain relative EAAA value). The species' AOO comprises an area of approximately 16km[40]. The AOO across the EAAA is precautionarily considered to be at approximately 100m^2, which is 0.0006% of the species' global AOO. However, despite this low estimate, the level of uncertainty around this species' global extent, and therefore the relative importance of the EAAA means that a precautionary assessment is considered appropriate here. On the basis that the EAAA does indeed support 0.5% of the global population of this species it **is considered of sufficient value for it to qualify as Critical Habitat under Criterion 2i(b) for *Lathyrus undulatus*.**

Table 3-17 - Russian sturgeon and Beluga sturgeon

Factor	Description
Species Conservation Status	**IUCN Critically Endangered**
Species EAAA	These species are potentially present in Küçükçekmece Basin IBA (from Aksehirli, 2005). This lake is therefore the EAAA. See Figure A-10.

[41] The AOO is the area within the EOO actually occupied by the species in question.

Factor	Description
Population Estimate	Unknown.
Global Population and Trend	Unknown. Decreasing[42] [43].
Assessment	The potential presence of both these species within Küçükçekmece Basin is unclear although there are no records which suggest it is present in any significant numbers – indeed the IUCN accounts for both species makes no mention of Küçükçekmece Basin being part of the remnant geographic extent for either species. In the absence of any evidence which suggests Küçükçekmece Basin still supports a population of these species, a precautionary assessment is adopted. **Given its IUCN CR status the EAAA is considered of sufficient value for it to qualify as a Priority Biodiversity Feature under Criterion 2i(b) for Russian sturgeon and Beluga sturgeon.**

Criterion 2ii. Range-restricted Species

3.4.2. There are eight biodiversity values qualify for consideration under Criterion 2ii. These are discussed individually below.

Table 3-18 - *Centaurea hermannii*

Factor	Description
Species Conservation Status	**IUCN DD** **Red Data Book of Turkish Plants[38] Endangered**
Species EAAA	*Centaurea hermannii* has specific habitat preferences, determined largely by soil chemistry and within the ZoI seemingly limited to the natural woodland areas (see Figure B-5). With this in mind, the

[42] Gesner, J., Chebanov, M. & Freyhof, J. 2010. *Huso huso*. The IUCN Red List of Threatened Species 2010: e.T10269A3187455.

[43] Gessner, J., Freyhof, J. & Kottelat, M. 2010. *Acipenser gueldenstaedtii*. The IUCN Red List of Threatened Species 2010: e.T232A13042340.

Factor	Description
	species EAAA extends across the G1.A EUNIS habitat, oak and hornbeam-dominated woodland and scrub mosaic. See Figure A-1.
Extent of Occurrence (EOO)	Endemic species. The EOO is approximately 1935km^2 based on estimated range extending across the Çatalca District and Ömerli basin, western Turkey (from Eroglu *et al.* 2014[44]).
Assessment	The number of individuals across the ZoI is considered to be in the region of 100. This is thought to represent up to 2% of the global population. This is markedly below the threshold of 10% required to meet this criterion. **The EAAA is therefore not considered of sufficient value for it to qualify as Critical Habitat under Criterion 3 for *Centaurea hermanni.***

Table 3-19 - *Cirsium Polycephalum (syn. byzanitnyum)*

Factor	Description
Species Conservation Status	**IUCN DD** **Red Data Book of Turkish Plants[38] Critically Endangered**
Species EAAA	This species appears to favour open woodland and scrub habitat and was recorded from the G1.A and F5.4 EUNIS habitat types (oak/hornbeam woodland and *Sparticum junceum* fields, respectively). With this in mind it is considered appropriate (in the absence of any more defined areas) to identify a EAAA which extends across these two habitat types within the ZoI (as per *Crocus olivieri* subsp. *Istanbulensis*). See Figure A-9.
Extent of Occurrence (EOO)	Endemic species. The EOO is considered to be approximately67,000km^2 based on it being present across the Marmara region.

[44] Eroglu, H. K., Ozyigit, I. I., Altay, V. & Yarci, C. 2014. Autecological characteristics of *Centaurea hermannii* f. herm an endemic species from Turkey

Factor	Description
Assessment	The species EOO exceeds the maximum threshold for consideration under this criterion (50,000km^2). **The EAAA is therefore not considered of sufficient value for it to qualify as Critical Habitat under Criterion 3 for *Cirsium polycephalum.***

Table 3-20 - *Crocus Olivieri Subsp. Istanbulensis*

Factor	Description
Species Conservation Status	**IUCN DD** **Red Data Book of Turkish Plants[38] Endangered**
Species EAAA	This species appears to favour open woodland and scrub habitat and was recorded from the F5.4 EUNIS habitat type (*Sparticum junceum* fields). With this in mind it is considered appropriate (in the absence of any more defined areas) to identify a EAAA which extends across G1.A (oak/hornbeam woodland) and F5.4 EUNIS habitat types. See Figure A-9.
Extent of Occurrence (EOO)	Endemic species. An accurate distribution of this species is not known. Previous studies (e.g. Tuncay & Akalin, 2018[45]) suggest a range restricted to east Istanbul, whereas the species was recorded from the ZoI and a wider range across the Marmara region has subsequently been reported. Prof. Duman suggests a distribution across the Thrace region (Duman *et al.* 2020[13]). An EOO of 67,000km^2 based on assumed presence across the Marmara region is considered appropriate.
Assessment	The species EOO exceeds the threshold for consideration under this criterion (50,000km^2). **The EAAA is therefore not considered of sufficient value for it to qualify as Critical Habitat under Criterion 3 for *Cirsium polycephalum.***

[45] Tuncay, O. & Akalin, E. 2018. Endemism in Istanbul Plants. Eur J Biol 2018; 77(1): 38-41.

Table 3-21 - *Crocus Pestalozzae*

Factor	Description
Species Conservation Status	**IUCN DD** **Red Data Book of Turkish Plants[38] Vulnerable**
Species EAAA	This species appears to favour open scrub habitat and stony habitats on hillsides (from Yusbazioglu et al., 2014[46]) and was recorded from the G1.A and F5.4 EUNIS habitat types (oak/hornbeam woodland and *Sparticum junceum* fields, respectively – see Figure B-7)). With this in mind it is considered appropriate (in the absence of any more defined areas) to identify a EAAA which extends across these two habitat types within the ZoI (as per *Crocus olivieri* subsp. *Istanbulensis*). See Figure A-9.
Extent of Occurrence (EOO)	Endemic species. The EOO is approximately 67,000km^2 based on it being endemic to the Marmara region; however, it's actual occurrence within Marmara will be far smaller (due to areas being unsuitable for the species) and, in the absence of evidence to the contrary, is assumed to be <50,000km^2 on a precautionary basis.
Assessment	The number of individuals across the EAAA is considered to be in the region of 5,000[39]. This is thought to represent up to 2% of the global population. This is significantly below the threshold of 10% required to meet this criterion. **The EAAA is therefore not considered of sufficient value for it to qualify as Critical Habitat under Criterion 3 for *Crocus pestalozzae.***

Table 3-22 - *Galanthus X Valentinei*

Factor	Description
Species Conservation Status	**IUCN DD** **Red Data Book of Turkish Plants[38] Vulnerable**

[46] Yuzbasioglu, S. & Ozhatay, N. (2014). A new subspecies of Crocus pestalozzae (Iridaceae) from Turkey. *Phytotaxa 174 (5):* 279-284.

Factor	Description
Species EAAA	This species appears to favour open woodland and scrub habitat and was recorded from the G1.A, F5.3, F6.2 EUNIS habitat types (oak/hornbeam woodland, pseudomaquis and eastern garrigues, respectively) (see Figure B-8). With this in mind it is considered appropriate (in the absence of any more defined areas) to identify a EAAA which extends across this woodland and scrub mosaic. See Figure A-1.
Extent of Occurrence (EOO)	Endemic species. The EOO is considered to be approximately 8,575km^2 based on it being present across the Thrace region (as per Yuzbasioglu, 2010[47]).
Assessment	The number of individuals across the EAAA is considered to be in the region of 25,000[39]. This is thought to represent up to 2% of the global population. This is significantly below the threshold of 10% required to meet this criterion. **The EAAA is therefore not considered of sufficient value for it to qualify as Critical Habitat under Criterion 3 for Galanthus *x valentinei.*** **Given that the EAAA is considered to support a regularly occurring range-restricted species, it qualifies under Criterion 2ii(a) as Priority Biodiversity Feature.**

Table 3-23 - *Lathyrus undulatum*

Factor	Description
Species Conservation Status	**IUCN Endangered**
Species EAAA	This species appears to favour open scrub habitat and stony habitats on hillsides together with anthropogenic environments, such as roadsides (Shehadeh et al. in prep in Rowe *et al.* 2019[48]).

[47] Yuzbasioglu, S. (2010). Türkiye'deki Kardelent (Galanthus) Taksonlarının Revizyonu. Doctoral Thesis. Istanbul University Institute of Sciences. Available: http://nek.istanbul.edu.tr:4444/ekos/TEZ/47430.pdf

[48] Rowe, J., Shehadeh, A. & Maxted, N. 2019. *Lathyrus undulatus*. *The IUCN Red List of Threatened Species* 2019: e.T176595A19405199. https://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T176595A19405199.en. Downloaded on 23 July 2020.

Factor	Description
	Given the above, and the apparent similarity in habitat preferences with *Crocus olivieri* subsp. *Istanbulensis*), the EAAAs for this species comprise G1.A and F5.4 EUNIS habitat types (oak/hornbeam woodland and *Sparticum junceum* fields, respectively). See Figure A-9.
Population Estimate	100 (see Assessment below).
Global Population and Trend	Unknown. Decreasing.
Assessment	No individuals have been recorded during surveys (both from March and July 2020). Although it is assumed to potentially still be present on a precautionary basis (and given that some survey effort - February/March surveys – was undertaken during a sub-optimal time for recording plants). Given that no plants were identified during July surveys (the plant will have been bearing fruit and readily identifiable at this time), the number of individuals across the EAAAs is likely to be limited. When considering the numbers of other rare plants identified during surveys, and the similar habitat characteristics of this species, a conservative estimate of up to 100 plants is considered appropriate. There is no reliable estimate as to a total number of individuals across the species' AOO[49], and so it is considered appropriate to assess the species within the context of its AOO at both EAAA and global range level (to ascertain relative EAAA value). The species' AOO comprises an area of approximately 16km^{40}. The AOO across the EAAA is precautionarily considered to be at approximately 100m^2, which is 0.0006% of the species' global AOO. Even with a significant under-estimate of this number, it is considered unlikely that the numbers would reach 10% of the global population (and 10% reproduction units). On this basis the EAAA **is not considered of sufficient value for it to qualify as Critical Habitat under Criterion 3i(a) for *Lathyrus undulatus*.** **Given that the EAAA is considered to support a regularly occurring range-restricted species, it qualifies under Criterion 2ii(a) as Priority Biodiversity Feature.**

[49] The AOO is the area within the EOO actually occupied by the species in question.

Criterion 2iii. Migratory / congregatory Species

3.4.3. Three biodiversity values have been identified with the potential to trigger Critical Habitat or Priority Biodiversity Feature under Criterion 2iii. These are assessed below.

Table 3-24 - Büyükçekmece Lake IBA

Factor	Description
Protected Area Designation	**International Bird Area**
Receptor EAAA	Protected area site boundary. See Figure A-10.
Summary Description[50]	A freshwater lake situated west of Istanbul where the Karasu stream reaches the Marmara Sea. The stream was dammed to create a drinking water reservoir; during dry years less than 25% of the lake area remains flooded. Mudflats, sandbanks and reedbeds (*Phragmites*) have formed where silt deposition occurs. South of the dam is a brackish lake with reed fringes and islands. The lake is largely surrounded by arable land and, increasingly, industrial and residential development. Motorways cut across both ends of the lake. This site is important for wintering and passage waterbirds. It also supports a range of breeding waterbirds. The qualifying features of the IBA are (listed population estimates in parenthesis): - Red-breasted goose (75-80) - Common pochard (14,036) - Little gull (1,740) - Mediterranean gull (10,000) - Yellow-legged gull (1,250-8,775) - Species group – waterbirds (22,681)
Assessment	The IBA does not support sufficient numbers of any single species to qualify as Critical Habitat under Criterion 4(a), with none of the IBA qualifying species' populations reaching 1% of the global population. The waterbirds assemblage at the IBA has been recorded as

[50] BirdLife International (2020) Important Bird Areas factsheet: Büyükçekmece Lake. Downloaded from http://www.birdlife.org on 17/08/2020.

Factor	Description
	exceeding the waterbird assemblage threshold for Ramsar designation (20,000 or more waterbirds, under Ramsar selection criterion 5[51]) within single years (such as 2014 and 2006); however, numbers within the last three years (potentially longer) have not exceeded this threshold. When considering the requirement for Ramsar designation under (Ramsar selection) Criterion 5 is for sites that *'…regularly support 20,000 or more waterbirds.',* and that 'regularly' in this context equates to two-thirds (or more) of seasons[52], then it is concluded that this site does not currently meet the threshold of Ramsar selection Criterion 5. **The Büyükçekmece Lake IBA is therefore not considered of sufficient value for it to qualify as Critical Habitat under Criterion 2iii.** **The Büyükçekmece Lake IBA is therefore considered of sufficient value for it to qualify as a Priority Biodiversity Feature under Criterion 2iii.**

Table 3-25 - Küçükçekmece Basin IBA

Factor	Description
Species Conservation Status	**International Bird Area**
Receptor EAAA	Protected area site boundary. See Figure A-11.
Summary Description[53]	A natural brackish lagoon (20m deep) situated west of Istanbul on the Sea of Marmara. Fringe vegetation is confined to an area of reedbed (*Phragmites*) in the north of the lagoon. Unplanned buildings surround the site; the only relatively undisturbed area lies

[51] Ramsar Convention Secretariat, 2010. Designating Ramsar Sites: Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance, Ramsar handbooks for the wise use of wetlands, 4th edition, vol. 17. Ramsar Convention Secretariat, Gland, Switzerland.

[52] Specifically: '…the requisite number of birds is known to have occurred in two thirds of the seasons for which adequate data are available, the total number of seasons being not less than three…'

[53] BirdLife International (2020) Important Bird Areas factsheet: Küçükçekmece Basin. Downloaded from http://www.birdlife.org on 17/08/2020.

Factor	Description
	within the grounds of the nuclear energy research centre and military camp on the east shore. A motorway passes to the north. The site holds significant numbers of wintering waterbirds. The qualifying features of the IBA are (population estimates in parenthesis): - Pygmy cormorant (126-160) - Great cormorant (10,200) - Species group – waterbirds (22,177)
Assessment	The IBA does not support a sufficient number of a single species to qualify as Critical Habitat under Criterion 2iii(a), with none of the qualifying species IBA populations reaching 1% of the global number. However, the waterbirds assemblage at the IBA is considered likely to exceed the threshold for Ramsar designation (under Ramsar selection criterion 5), with greater than 20,000 waterbirds being supported by the IBA on a regular basis (MWC from 2018-20 were 22,022, 30,520 and 23,344 respectively). **As a result of meeting the threshold for Ramsar selection, the Küçükçekmece Basin IBA is considered of sufficient value for it to qualify as Critical Habitat under Criterion 2iii.**

Table 3-26 - Terkos Basin KBA and IBA

Factor	Description
Species Conservation Status	**Key Biodiversity Area**
Receptor EAAA	Protected area site boundary. See Figure A-5.
Summary Description	This site comprises a complex of aquatic and swamp communities, associated with Terkos Lake (one of İstanbul's most important drinking water reservoirs) and sand dune habitats, set in a hinterland of grassland, heath and coppice forest habitats. The site holds significant numbers of wintering, passage and breeding waterbirds. The qualifying features of the IBA are (listed population estimates in parenthesis; wintering populations unless otherwise stated): - Red-breasted goose (90) - Ferruginous duck (20 breeding pairs)

Factor	Description
	- Black stork (5-10 breeding pairs) - Pygmy cormorant (32 individuals on passage) - Pygmy cormorant (224) - Whiskered tern (45 breeding pairs)
Assessment	The Terkos Basin KBA and IBA does not support a sufficient number of a single species to qualify as Critical Habitat under Criterion 3(a), with none of the qualifying species IBA populations reaching 1% of the global number. **The Terkos Basin is not considered to trigger Critical Habitat or a Priority Biodiversity Feature under Criterion 2iii.**

Criterion 2iv. Significant biodiversity features

Table 3-27 - Terkos Basin KBA

Factor	Description
Species Conservation Status	**Key Biodiversity Area**
Receptor EAAA	Protected area site boundary. See Figure A-5.
Summary Description[54]	The KBA supports a range of waterbirds as well as rare plants, mammals, amphibians and insects.
Assessment	Although several endemic plant species are listed as being present within the Terkos Basin KBA, there is no indication that the site supports sufficient numbers of any one species to meet the threshold for Critical Habitat under Criterion 3; however, it is considered to represent a significant biodiversity feature, recognised by a broad set of stakeholders (e.g. such as the Turkish Government, Birdlife, etc.) and therefore qualifies as a Priority Biodiversity Feature under criterion 2iv (as per paragraph 2.2.2). **The Terkos Basin KBA is not considered of sufficient value for it to qualify as Critical Habitat under Criterion 2.**

[54] BirdLife International (2020) Important Bird Areas factsheet: Terkos Basin. Downloaded from http://www.birdlife.org on 17/08/2020.

Factor	Description
	The Terkos Basin KBA is considered of sufficient value for it to qualify as a Priority Biodiversity Feature under Criterion 2ii.

3.5 CRITERION 3 – KEY EVOLUTIONARY PROCESSES

3.5.1. No biodiversity values triggering Critical Habitat under Criterion 5 have been identified for the Project.

3.6 CRITERION 4 – KEY ECOLOGICAL FUNCTIONS

3.6.1. No biodiversity values triggering Critical Habitat under Criterion 6 have been identified for the Project.

3.7 SUMMARY

CRITICAL HABITAT

3.7.1. In summary, the following biodiversity values are considered to trigger Critical Habitat for the associated EAAA:

- *Centaurea hermannii* (under Criterion 2i(d))
- *Lathyrus undulates* (under Criterion 2i(b))
- White-headed duck (under Criterion 2i(b))
- Küçükçekmece Basin (under Criterion 2iii and as EAAA for white-headed duck)

3.7.2. As a result of the above summary, the following EAAAs are considered to be Critical Habitat:

- *Centaurea hermannii* EAAA
- *Lathyrus undulates* EAAA
- Küçükçekmece Basin (under Criterion 2iii and as EAAA for white-headed duck)
- Büyükçekmece Lake (as EAAA for white-headed duck)

PRIORITY BIODIVERSITY FEATURES

3.7.3. The following biodiversity values are considered to trigger Priority Biodiversity Features for the associated EAAAs:

- EU Habitats Directive Annex I Habitat: 9170 Galio-carpinetum oak-hornbeam forests.
- Common pochard (under Criterion 2)
- Eastern imperial eagle (under Criterion 2)
- Greater spotted eagle (under Criterion 2)
- Long-fingered bat
- Bats (general)
- Marbled polecat
- Common pochard
- Red breasted goose
- European ground squirrel (under Criterion 2)
- *Crocus Olivieri* Subsp. *istanbulensis* (2d),

- *Cirsium Polycephalum* (Syn. i).
- *Galanthus X Valentinei* (3a).
- Russian sturgeon and Beluga sturgeon
- Büyükçekmece Lake IBA (under Criterion 4)
- Terkos Basin KBA (under Criterion 3)

4 PR6 COMPLIANCE REVIEW

4.1 INTRODUCTION

4.1.1. Upon completion of the CHA it is necessary to review Project compliance against the requirements of PR6. This has been done with the assessment outcome derived from the Project ESIA and should be read in conjunction with that report. The assessment requirements of PR6 are explicitly detailed within **Section 2.5** and discussed individually below in terms of Project compliance.

4.1.2. As per the requirements of PR6, this process applies to all areas of Critical Habitat in which Project activities are planned (i.e. regardless of impact). In terms of Priority Biodiversity Features, this compliance review only applies where '…*significant, adverse and irreversible*…' impacts have been identified. **Table 4-1** summarises this position for each Priority Biodiversity Feature (as derived from the assessment within ESIA **Chapter 8: Ecology**):

Table 4-1 - Priority Biodiversity Features Compliance Screening

Priority Biodiversity Feature	Assessment Conclusion[55]
Oak-hornbeam woodland	Minor habitat loss effect (not significant)
Common pochard	Neutral disturbance impact (not significant).
Red-breasted goose	Neutral disturbance impact (not significant).
Eastern imperial eagle	Major disturbance impact during construction and collision risk impact (significant).
Greater spotted eagle	Negligible receptor value – not assessed.
Long fingered bat	Minor habitat loss, collision risk and acoustic disturbance effects (not significant).
Bats (general)_	Minor habitat loss, collision risk and acoustic disturbance effects (not significant).
European ground squirrel	Minor habitat loss impact (not significant).

[55] Impact of greatest significance listed, in the absence of any mitigation.

Priority Biodiversity Feature	Assessment Conclusion[55]
Marbled polecat	Minor habitat loss, collision mortality and habitat fragmentation effects (not significant)
Spur-thighed tortoise	Minor habitat loss, collision mortality and habitat fragmentation effects (not significant)
Crocus Olivieri subsp. *Istanbulensis* (2d),	Moderate habitat loss and invasive species-related effects (not significant)
Cirsium Polycephalum (Syn. *Byzanitnyum*).	Moderate habitat loss and invasive species-related effects (not significant)
Galanthus X Valentinei)	Moderate habitat loss and invasive species-related effects (not significant)
Russian sturgeon and Beluga sturgeon	Neutral effects (not significant)
Büyükçekmece Lake IBA	Moderate collision risk impact to IBA waterbird assemblage (significant).
Terkos Basin KBA and IBA	Minor habitat loss impact (not significant).

4.1.3. Upon completion of the compliance review, any mitigation required to achieve compliance is described.

4.1.4. The compliance review is detailed within **Table 4-2** below.

Table 4-2 - PR6 Compliance Review Table

PR6 Compliance Criteria	Supporting Information	Outcome	Further Actions
No viable alternative / no technically or economically feasible alternative.	See ESIA **Chapter 3: Consideration of Alternatives** for full details. The Project was chosen due to having the lowest environmental, social, technical and economic impacts. Specifically, with regards biodiversity, the Project benefits over potential alternatives due to the following features: ▪ Lower emissions than non-rail options under consideration; ▪ Tunnelling beneath Küçükçekmece Basin IBA and therefore avoiding direct impacts to Critical Habitat here; ▪ Avoidance of woodland habitat (e.g. between chainages 65+000 and 66+000); and ▪ Close alignment with the existing railway across large sections of the Project route and therefore minimising impacts associated with habitat loss, fragmentation and 'new' disturbance impacts at these sections.	Compliant.	No further actions.
Stakeholders are consulted in accordance with PR10.	A number of relevant stakeholders have been consulted in relation to the Project. These have included Government departments, national conservation organisations (Doga), as well as in-country experts and academics (see Section 2.3). Furthermore, the local population and leaders were consulted during the National EIA process.	Compliant.	No further actions.
The project is permitted under applicable environmental laws, recognising the priority biodiversity features.	Permitted. See ESIA **Chapter 1: Introduction**.	Compliant.	No further actions.
The project does not lead to measurable adverse impacts on those biodiversity features for which the Critical Habitat was identified (by this assessment).	Full impact assessment of these below values is included within ESIA **Chapter 8: Ecology**. A high-level summary is included here. **Critical Habitat** ***Centaurea hermannii*** All individuals of this species recorded during field surveys will be at risk of direct loss from the Project during construction. It is assumed that this represents around half of the ZoI population. This represents a significant impact upon the Critical Habitat. ***Lathyrus undulatus*** It is assumed that losses to this species will be significant given the small global population size (and in the absence of more robust information regarding the species distribution across the ZoI and wider area). This represents a significant impact upon the Critical Habitat. **White-headed duck** Minor disturbance impacts are predicted for this species during construction by virtue of the Project's close proximity to Büyükçekmece Lake and Küçükçekmece Basin. Direct impacts to Critical Habitat for this species are expected as a result of the loss of terrestrial habitat that falls within the IBA boundary (and therefore is included within the Büyükçekmece Lake EAAA). **Küçükçekmece Basin** No/negligible direct impacts to this IBA are expected due to extensive tunnelling at this location (resulting in the site being excluded from any direct impacts) and also because of low speed levels within the peripheral areas. **Priority Biodiversity Features** **Oak/hornbeam woodland** A minor adverse effect is expected as a result of habitat loss and invasive species encroachment in to this receptor's current EAAA. **Common pochard**	Compliant assuming appropriate mitigation as per Section 4.2:	Species-specific actions within a Project **Biodiversity Management Plan** (BMP).

PR6 Compliance Criteria	Supporting Information	Outcome	Further Actions
	No impacts are expected for this species **Red-breasted goose** No impacts are expected for this species **Eastern imperial eagle** A significant disturbance impact has been identified in relation to this species while breeding. Loss of any breeding pairs within the EAAA would represent a significant impact given the value of this receptor. Similarly, given the species' confirmed close proximity to the Project and the potential for the Project to be located within foraging habitat, a significant train collision risk impact has been identified. **Greater spotted eagle** No impacts are expected for this species **Long-fingered bat** A minor adverse effect is predicted for this receptor as a result of habitat loss and loss/disturbance of roost sites, together with increased disturbance during operation. **Bats (general)** A minor adverse effect is predicted for this receptor as a result of habitat loss and loss/disturbance of roost sites, together with increased disturbance during operation. **Marbled polecat** Minor adverse effects have been predicted for this receptor as a result of injury/death during construction and operation and habitat fragmentation. **European ground squirrel** Minor adverse effects have been predicted for this receptor as a result of injury/death during construction and operation and habitat fragmentation. **Spur-thighed tortoise** Minor adverse effects have been predicted for this receptor as a result of injury/death during construction and operation and habitat fragmentation. ***Crocus olivieri* subsp. *Istanbulensis*** A moderate adverse effect has been predicted for this species as a result of habitat loss and potential invasive species encroachment during construction. ***Cirsium polycephalum*** A moderate adverse effect has been predicted for this species as a result of habitat loss and potential invasive species encroachment during construction. ***Galanthus x valentinei*** A moderate adverse effect has been predicted for this species as a result of habitat loss and potential invasive species encroachment during construction. **Russian sturgeon and Beluga sturgeon** No impacts are expected for these species **Terkos Basin KBA** A minor adverse effect is expected as a result of habitat loss and invasive species encroachment in to the KBA. **Büyükçekmece Lake**		

PR6 Compliance Criteria	Supporting Information	Outcome	Further Actions
	A number of waterbirds associated with this wetland have been recorded flying at potential collision height, resulting in a moderate adverse effect being identified.		
The project is designed to deliver net gains for Critical Habitat impacted by the project/at least no net loss for Priority Biodiversity Features.	**Critical Habitat** ***Centaurea hermannii*** As specified in the **BMP**, a **Biodiversity Action Plan** will be produced that will detail the measures to be taken to ensure a Net Gain in the population of this species. This will include collection, propagation and replanting of specimens. ***Lathyrus undulatus*** As specified in the **BMP**, a **Biodiversity Action Plan** will be produced that will detail the measures to be taken to ensure a Net Gain in the population of this species. This will include collection, propagation and replanting of specimens. **White-headed duck** The Project will commit to secure net gains for the EAAAs for this species through material contribution to conservation management at Büyükçekmece Lake and Küçükçekmece Basin. **Küçükçekmece Basin** As above. **Priority Biodiversity Features** **Oak/hornbeam woodland** Mitigation measures described within the ESIA will form the basis of a **BMP** to ensure no net loss for this habitat. This will include a restoration/replanting plan to maintain the current extent of this habitat across its EAAA. **Common pochard** No impacts are expected for this species – no additional measures required. Measures to support conservation management at Büyükçekmece Lake and Küçükçekmece Basin will benefit this species also. **Red-breasted goose** No impacts are expected for this species – no additional measures required. Measures to support conservation management at Büyükçekmece Lake and Küçükçekmece Basin will benefit this species also. **Eastern imperial eagle** Mitigation measures described within the ESIA will form the basis of a **BMP** to ensure no net loss for this species. This will include pre-construction surveys, monitoring of nest sites (where required) and measures to minimise collision risk. **Greater spotted eagle** No impacts are expected for this species – no additional measures required. **Long-fingered bat** Mitigation measures described within the ESIA will form the basis of a **BMP** to ensure no net loss for this species. This will include pre-construction surveys to identify roost sites to be protected, provision of replacement habitat and artificial roost structures as required. **Bats (general)** Mitigation measures described within the ESIA will form the basis of a **BMP** to ensure no net loss for this species. This will include pre-construction surveys to identify roost sites to be protected, provision of replacement habitat and artificial roost structures as required. **Marbled polecat**	Compliant assuming appropriate mitigation as per Section 4.2	Provision of **Biodiversity Action Plan** (BAP) for *Centaurea hermannii*. Provision of **BMP**.

PR6 Compliance Criteria	Supporting Information	Outcome	Further Actions
	No impacts are expected for this species – no additional measures required. Generic mitigation applicable to this species includes pre-construction survey effort to identify burrows of this species, which will be protected during construction, and provision of animal underpasses. **European ground squirrel** No impacts are expected for this species – no additional measures required. Generic mitigation applicable to this species includes pre-construction survey effort to identify burrows of this species, which will be protected during construction, and provision of animal underpasses. **Spur-thighed tortoise** Mitigation measures described within the ESIA will form the basis of a **BMP** to ensure no net loss for this species. This will include pre-construction surveys to identify particular concentrations of this species together with targeted animal underpasses in areas of greatest importance for this species. ***Crocus olivieri* subsp. *Istanbulensis*** As specified in the **BMP**, a **Biodiversity Action Plan** will be produced that will detail the measures to be taken to ensure No Net Loss (and ideally a Net Gain) in the population of this species. This will include collection, propagation and replanting of specimens. ***Cirsium polycephalum*** As specified in the **BMP**, a **Biodiversity Action Plan** will be produced that will detail the measures to be taken to ensure No Net Loss (and ideally a Net Gain) in the population of this species. This will include collection, propagation and replanting of specimens. ***Galanthus x valentinei*** As specified in the **BMP**, a **Biodiversity Action Plan** will be produced that will detail the measures to be taken to ensure No Net Loss (and ideally a Net Gain) in the population of this species. This will include collection, propagation and replanting of specimens. **Russian sturgeon and Beluga sturgeon** No direct (or indirect) impacts are anticipated given the species' potential presence within Küçükçekmece Basin and the tunnelling pf the Project at this point. Regardless, a robust suite of hydrological mitigation is embedded into Project design, which will prevent impacts to ground and surface water. This is detailed within ESIA **Chapter 11: Surface Water Environmental Hydrology** and **Chapter 12: Geology and Hydrogeology**). **Terkos Basin KBA** Mitigation measures described within the ESIA will form the basis of a **BMP** to ensure no net loss for this site. This will be achieved through habitat restoration/replanting as required **Büyükçekmece Lake** Mitigation measures described within the ESIA will form the basis of the **BMP** to ensure no net loss for this site (specifically in relation to species-specific impacts).		
The project is not anticipated to lead to a net reduction in the population of any endangered or critically endangered species.	None expected.	Compliant.	No further actions.
A robust and appropriately designed, long-term biodiversity monitoring and evaluation programme for	A **BAP** will be produced specifically in relation to address impacts to *Centaurea hermannii, Lathyrus undulatus* and white-headed duck. This will be produced in line with PR6.	Compliant.	**BAP/BMP**

PR6 Compliance Criteria	Supporting Information	Outcome	Further Actions
Critical Habitat will be produced.			
The overall benefits outweigh the project impacts on biodiversity.	The Project is part of an overall strategy to close gaps, remove bottlenecks and technical barriers, as well as to strengthen social, economic and territorial cohesion in the EU. See ESIA **Chapter 1: Introduction** for full details.	Compliant.	No further actions.

4.2 MITIGATION PROPOSALS

4.2.1. A number of bespoke and generic mitigation measures are described within the ESIA to minimise impacts to biodiversity receptors so that they are at a level that is considered acceptable. With regards Critical Habitats/Priority Biodiversity Features, the requirement for mitigation extends to ensuring no net loss and in the case of Critical Habitats, a measurable net gain.

4.2.2. This section provides a high-level description of the mitigation measures that will be deployed to ensure PR6 compliance, for each biodiversity feature as per **Table 4-2**. These measures will be detailed in full within the Project **BMP** and in the case of *Centaurea hermannii, Lathyrus undulatus* and white-headed duck, a standalone **BAP**. Both of these documents will delivered (updated in the case of the **BMP**) and approved as part of the **Environmental and Social Action Plan** and will remain live documents that will require management and ownership in perpetuity (with specific programme commitments described within each document).

4.2.3. Aside from specific measures (applicable to single receptors), a series of generic measures (applicable to multiple receptors) will also be undertaken. These are described first.

GENERIC MITIGATION

4.2.4. A Project survey will be undertaken in advance of any construction activities in order to corroborate findings to date and to fully inform mitigation proposals. This will be an overarching biodiversity action (as required to deliver mitigation outlined within the ESIA) but will also satisfy the requirements in relation to the CHA.

4.2.5. The walkover will be undertaken by a suitably experienced specialist, with regional expertise, and should be timed to align with relevant optimal survey periods (i.e. multiple walkovers may be required to achieve this). For the purposes of the CHA mitigation, the specialist will focus identifying/confirming the locations of features of interest described within this report, especially those for which Critical Habitat/Priority Biodiversity Features have been triggered. These features will be accurately mapped.

4.2.6. A suitably experienced Ecological Clerk of Works (ECoW) will be instructed to perform an advisory role on the project. The ECoW will support the project during the pre-construction phase (i.e. to help ensure any necessary pre-emptive measures are sufficiently in place) and during construction activities. The ECoW role will be to oversee delivery of the **BMP** (and **BAP**) and may include (but is not limited to) the following activities:

- Confirming the location of important biodiversity features (as identified from the current studies and the pre-construction walkovers).
- Advising on micrositing (where possible) to avoid loss/disturbance to biodiversity from the Project.
- Buffering specific features of interest to avoid disturbance – e.g. excluding construction activities around a bird's nest or mammal burrow while it is in use.
- Producing Method Statements for safe-working.
- Delivering toolbox talks to site operatives, including during site inductions, to advise on good practice construction behaviours to minimise risks to biodiversity (e.g. securing works areas when not in use, reducing the use of overnight lighting, etc.).
- Overseeing destructive searches of features/habitat where the potential for sensitive fauna to be present has been identified.

4.2.7. Where possible, construction activities will be sympathetically timed to avoid seasonal biodiversity sensitivities, e.g. breeding bird season. This programming will be informed from details obtained from the above walkovers together with proactive engagement with project engineers and programmers. Where avoidance is not possible, the Project ECoW will advise on measures to protect nest sites (and other sensitivities, such as bat roosts) during construction, e.g. through use of exclusion zones. Specific information with regards timing of works is provided within the **BMP**.

4.2.8. An **Invasive Species Management Plan** should be produced in advance of works that details the measures that should be taken to prevent the introduction and spread of invasive species. Delivery of this plan should be overseen by the ECoW.

4.2.9. Measures to reduce collision risk to avifauna will be detailed within a landscaping plan. Such measures will include (but are not limited to) adapted fencing in high risk areas to divert bird flights. These features will be located within areas identified as having highest potential collision risk (see ESIA).

CRITICAL HABITAT

Centaurea hermannii and *Lathyrus undulatus*

4.2.10. The walkover described above will include a detailed search for individuals of these species in order to describe an inventory of occurrence across the Project footprint. Once this has been completed, specific mitigation measures will be actioned, as fully detailed within a **BAP** for the species.

The **BAP** will be produced in consultation with key stakeholders to help facilitate its delivery and long-term success. This stakeholder consortium will likely include (but are not limited to): botanical specialists, landowners, relevant government officials, etc. At this stage, it is recommended that individuals from Nezahat Gokyigit Botanical Gardens in Istanbul[56] are contacted to assist with this practical conservation initiative.

4.2.11. Specific measures in relation to this species are as follows:

- Protection of plants in immediate proximity of the Project (but not directly affected).
- Collection of plants from the Project footprint to be translocated across several suitable areas in proximity to the Project (to be agreed in advance by the stakeholder consortium to ensure long-term viability of this initiative). Specimens collected during this exercise will be retained to be used for propagation by a suitably experienced botanist.
- Plants propagated from the above will be used to supplement existing and translocated populations, as agreed in advance by the stakeholder consortium.
- Translocated/introduced plants will be monitored on an annual basis to begin with (and then with decreasing frequency as considered appropriate by the stakeholder consortium).

[56] http://www.ngbb.org.tr/en/index.html. Burcin Cingay (burcin.cingay@ngbb.org.tr) is the Head of the Science Department.

- Toolbox talks to site operatives during construction to ensure protection of those plants identified above.

White-headed duck

4.2.12. Given the lack of adverse impacts expected for this species there is no dedicated mitigation required. Avoidance of construction activities around Büyükçekmece Lake and Küçükçekmece Basin during winter months has been recommended where possible.

Securing Net Gains

4.2.13. The Project is required to deliver net gains for *C. hermannii* and *Lathyrus undulatus*. The primary mechanism for doing so will be the propagation of plants collected pre-construction and their introduction to areas that will remain in sympathetic management in perpetuity.

4.2.14. A target of propagating and introducing new plants is 100 specimens, which represents a 100% increase on the current population estimate within the ZoI. This target will be reviewed as per annual monitoring, described within the **BMP**.

4.2.15. In order to secure net gains for white-headed duck (at Büyükçekmece Lake and Küçükçekmece Basin Critical Habitat), the Project should make a material contribution to conservation efforts currently being undertaken at both of these sites by Doga. This contribution could be financial, or through provision of personnel to assist with practical conservation work being undertaken. Both IBAs are currently under some form of management and contributions made by the Projects will actively support such management, so securing a Net Gain for this species (through habitat improvements) is entirely feasible. In the case of Büyükçekmece Lake, the current conservation measures are limited by resources and capacity[19] and so a clearly feasible opportunity for securing Net Gains exists here. Specific details regarding what these improvements would comprise will be detailed within the **BAP**.

4.2.16. Further to the above and in recognition of Büyükçekmece Lake as Critical Habitat, it will be necessary to undertake habitat restoration/replanting across sections of the Project where it bisects this site and results in direct habitat losses; in particular this is relevant to chainages 22+000 to 24+000 and 26+000 to 28+000. Replanting should be detailed within a bespoke **Habitat Restoration Plan (HRP)**, which will be produced/approved by AGYM in advance of construction activities.

PRIORITY BIODIVERSITY FEATURES

Oak-hornbeam woodland

4.2.17. Where possible, this habitat will be avoided through micrositing. Assuming this is not possible then mitigation will be delivered through the **HRP** that will include areas for restoration and replanting to replace the predicted 74.3ha of this habitat that will be lost during construction. This will be achieved through replanting between chainages 39+000 and 43+000 to replace planted coniferous woodland in these areas (therefore expanding the oak-hornbeam woodland EAAA here). The **HRP** will also include measures to manage and monitor restored/replanted habitats to ensure their presence in perpetuity (e.g. for the lifetime of the Project).

Eastern imperial eagle

4.2.18. The pre-construction walkovers will include a dedicated eagle survey to search for active imperial eagle territories (such as that currently identified to the east of Akören). In addition, further

consultation with Doga should be undertaken to gather latest imperial eagle territory information, relevant to the Project. Once identified, these will inform timing of works within these areas, as required (and across an appropriate study area distance, e.g. up to 1km). The **BMP** will include measures to be taken should construction activities be proposed within this exclusion time during the breeding season (assumed to be March to June inclusive). Such measures may include a watching brief of eagle activity during construction to identify any behaviours indicative of disturbance, and the subsequent authority for the ECoW to cease construction activities until such time that a significant disturbance threat no longer exists (e.g. once the young birds have fledged the nest).

4.2.19. Flight activity surveys should be undertaken during the 2021 breeding season to identify where eagles may be at risk of collision during this time (when their flight behaviour exposes them to the greatest risk in this regard). These surveys should focus on areas around known territories (as obtained from 2020 surveys and after consultation with Doga).

4.2.20. Once the areas of highest risk have been identified, appropriate landscaping/screening of the railway at these locations should be undertaken through such measures as adapted Project fencing to act as a flight diverter. The specifications of such measures should be agreed in advance with Project engineers and other relevant stakeholders and should be approved in advance as part of the **BMP**.

Bats (including long-fingered bat)

4.2.21. The pre-construction surveys during 2021 will include a dedicated search of suitable features/structures within the Project ZoI for bat roosts. Those identified will be used to inform the construction programme where possible (i.e. with works timed to avoid the months when these roosts are occupied). Findings will also inform micrositing of works to ensure avoidance of any roosts is achieved. For those roosts considered to be at risk of loss/significant disturbance, it may be necessary to provide artificial roost sites, should there not be sufficient alternative roosts already present in the area. The biodiversity specialist will advise throughout to ensure mitigation is appropriate and will achieve no net loss of the bat populations across the EAAAs.

Spur-thighed tortoise

4.2.22. Mitigation measures described within the ESIA will form the basis of a **BMP** to ensure no net loss for this species. This will include pre-construction surveys to identify particular concentrations of this species together with targeted animal underpasses in areas of greatest importance for this species.

Rare plants

4.2.23. The rare plant species identified as Priority Biodiversity Features trigger species will be subject to the same mitigations measures as required for *Centaurea hermannii* and *Lathyrus undulatus*. See **paragraph 4.2.11**.

Büyükçekmece Lake IBA

4.2.24. Areas of highest collision risk to the IBA-qualifying birds will be subject to appropriate landscaping/screening of the Project at these locations, through an adapted Project fencing design. This will comprise installation of flight diverter ‘poles’ fitted to the 2m high Project fencing, at 1m intervals. The poles will include robust red/white tape to increase effectiveness. The exact specifications of such measures should be agreed in advance with Project engineers and other

relevant stakeholders and should be approved in advance as part of the developed **BMP**. Further details are provided within ESIA **Chapter 8 – Biodiversity.**

Terkos Basin KBA

4.2.25. Mitigation measures described within the ESIA will form the basis of a **BMP** to ensure no net loss for this site. This will comprise habitat restoration/replanting as required

5 CONCLUSIONS

5.1.1. This CHA has concluded that the Project is located within an area that supports Critical Habitat for the plant species *Centaurea hermannii*, white-headed duck and the Küçükçekmece Basin. Of these, potential adverse impacts have been identified for *C. hermannii*. Additionally, six Priority Biodiversity Features have been identified, of which potential impacts have been identified for imperial eagle and Büyükçekmece Lake IBA.

5.1.2. In order for the Project to be compliant with the requirements of PR6, a series of mitigation measures have been recommended that will be delivered through a Project **Biodiversity Management Plan** and, in the case of Critical Habitat, a Biodiversity Action Plan, the latter with specific aims to achieve a net gain for *C. hermanni* and therefore achieving a key aspect of PR6 compliance.

Appendix A

EAAA FIGURES

Confidential



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- G1.A Galio-carpinetum woodland mosaic



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure A-1
G1.A Galio-carpinetum woodland mosaic

Scale at A4
1:300,000

Drawn			
RW			
Stage 1 check	Stage 2 check	Originated	Date
JS	JW	DG	23/02/2021

0 1.25 2.5 5 7.5 10
Km

wsp

Drawing Number
Figure A-9

Path: \\uk.wspgroup.com\central data\Projects\70069878xx\70069878 - IPPF - Turkey TCDD Halkali - Cerkezkoy High Speed Railway\03 WIP\GIS\Mxd\Chapter 8 Appendix A Figure A-1 - G1.A Galio-carpinetum woodlandmosaic.mxd



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Important Bird and Biodiversity Areas (IBAs)



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure A-2 - Protected Areas

Scale at A4: 1:350,000

Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
JS	JW	DG	23/02/2021

0 1.25 2.5 5 7.5 10
Km

wsp

Drawing Number: Figure A-2

Path: \\uk.wspgroup.com\central data\Projects\70069878xx\70069878 - IPPF - Turkey TCDD Halkali - Cerkezkoy High Speed Railway\03 WIP\GIS\Mxd\Chapter 8 Appendix A Figure A-2 - Protected Areas.mxd



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

Proposed Railway Route

Important Bird Areas

Büyükçekmece Lake

Küçükçekmece Basin



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure A-3
White-headed duck EAAA

Scale at A4
1:280,000

Drawn			
RW			
Stage 1 check	Stage 2 check	Originated	Date
JS	JW	DG	23/02/2021

0 1 2 4 6 8
Km

wsp

Drawing Number
Figure A-3

Path: \\uk.wspgroup.com\central data\Projects\700698xx\70069878 - IPPF - Turkey TCDD Halkali - Cerkezkoy High Speed Railway\03 WIP\GIS\Mxd\Chapter 8 Appendix A Figure A-3 White-headed duck EAAA.mxd



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Legend

- Proposed Railway Route
- Imperial Eagle EAAA



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure A-4
Imperial Eagle EAAA

Scale at A4
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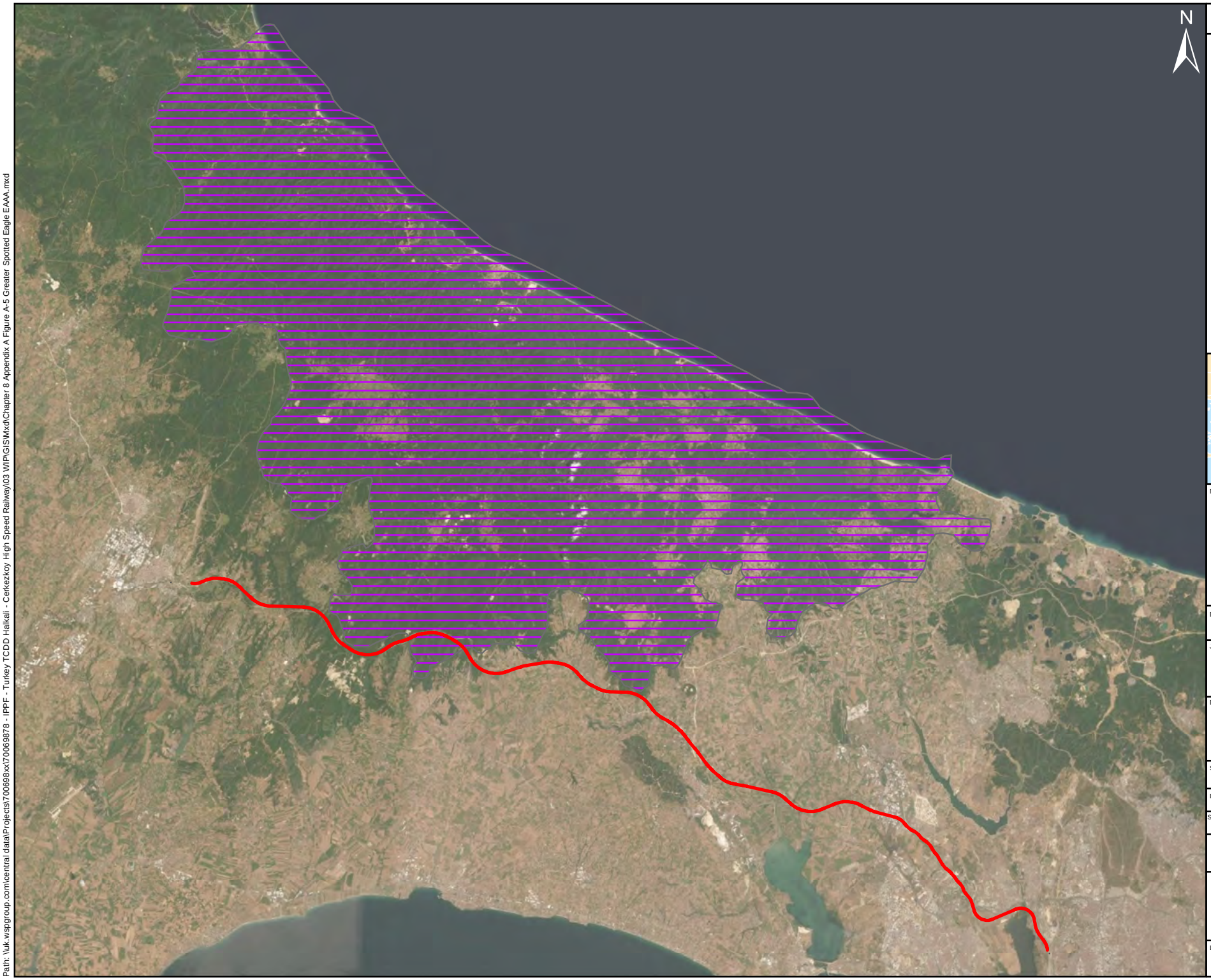
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Drawing Number
Figure A-4

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Legend

- Proposed Railway Route
- Greater Spotted Eagle EAAA



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure A-5
Greater Spotted Eagle EAAA

Scale at A4
1:350,000

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Km

Drawing Number
Figure A-5



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Legend

- Proposed Railway Route
- Long-fingered Bat EAAA



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure A-6 Long-fingered Bat EAAA

Scale at A4: 1:270,000

Drawn			
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Stage 1 check	Stage 2 check	Originated	Date
JS	JW	DG	23/02/2021

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Drawing Number: Figure A-6

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Path: \\uk.wspgroup.com\central data\Projects\700698xx\70069878 - IPPF - Turkey TCDD Halkali - Cerkezkoy High Speed Railway\03 WIP\GIS\Mxd\Chapter 8 Appendix A Figure A-7 – European Ground Squirrel EAAA.mxd

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Legend

- Proposed Railway Route
- European Ground Squirrel EAAA



Note:

Drawing Status

FINAL

Job Title:

HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title

Figure A-7
European Ground Squirrel EAAA

Scale at A4

1:270,000

Drawn			
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0 1 2 4 6 8
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Drawing Number

Figure A-7



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Non-Wooded / Built-Up Areas EAAA



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure A-8 Non-Wooded/Built-Up Areas EAAA

Scale at A4: 1:280,000

Drawn			
RW			
Stage 1 check	Stage 2 check	Originated	Date
JS	JW	DG	23/02/2021

0 1 2 4 6 8 Km

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Drawing Number: Figure A-8

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Legend

- Proposed Railway Route
- G1.A Galio-carpinetum woodland mosaic



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure A-9
G1.A Galio-carpinetum woodland mosaic / F5.4 Spartium junceum fields EAAA

Scale at A4
1:300,000

Drawn			
RW			
Stage 1 check	Stage 2 check	Originated	Date
JS	JW	DG	23/02/2021

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Km

wsp

Drawing Number
Figure A-9

Path: \\uk.wspgroup.com\central data\Projects\700698xx\70069878 - IPPF - Turkey TCDD Halkali - Cerkezkoy High Speed Railway\03 WIP\GIS\Mxd\Chapter 8 Appendix A Figure A-9 - G1.A Galio-carpinetum woodlandmosaic and F5.mxd



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Legend

- Proposed Railway Route
- Büyükçekmece Lake IBA



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure A-10
Büyükçekmece Lake IBA EAAA

Scale at A4
1:270,000

Drawn			
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JS	JW	DG	23/02/2021

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Drawing Number
Figure A-10

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Path: \\uk.wspgroup.com\central data\Projects\700698xx\70069878 - IPPF - Turkey TCDD Halkali - Cerkezkoy High Speed Railway\03 WIP\GIS\Mxd\Chapter 8 Appendix A Figure A11 - Kuyukcekmece basin IBA, Russian sturgeon and Beluga sturgeon EAAAs.mxd

THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Kuyukcekmece basin IBA



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure A-11
Kuyukcekmece basin IBA, Russian sturgeon and Beluga sturgeon EAAAs

Scale at A4
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Stage 1 check	Stage 2 check	Originated	Date
JS	JW	DG	23/02/2021

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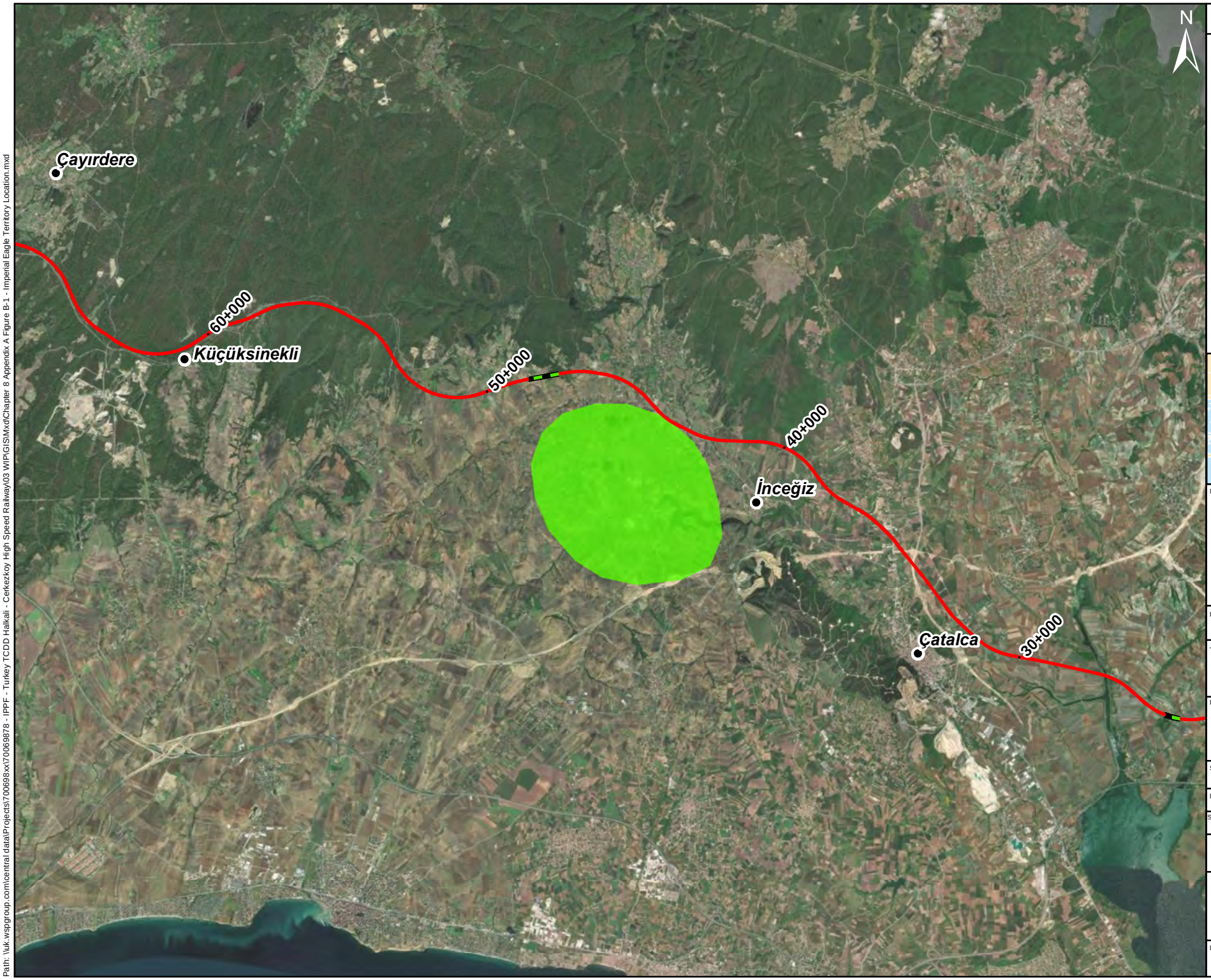
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Drawing Number
Figure A-11

Appendix B

RECEPTOR LOCATION FIGURES

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Legend

- Town
- Proposed Railway Route
- Tunnel (Cut - Cover)
- Imperial eagle territory location



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure B-1 - Approximate Imperial Eagle Territory Location

Scale at A4: 1:150,000

Drawn			
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Stage 1 check	Stage 2 check	Originated	Date
JS	JW	DG	23/02/2021

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Drawing Number: Figure B-1

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Legend

- Town
- Proposed Railway Route
- Tunnel (TBM - Double Tube)
- Tunnel (Cut - Cover)
- European Ground Squirrel Presence



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure B-2 - Confirmed European Ground Squirrel Presence

Scale at A4: 1:50,000

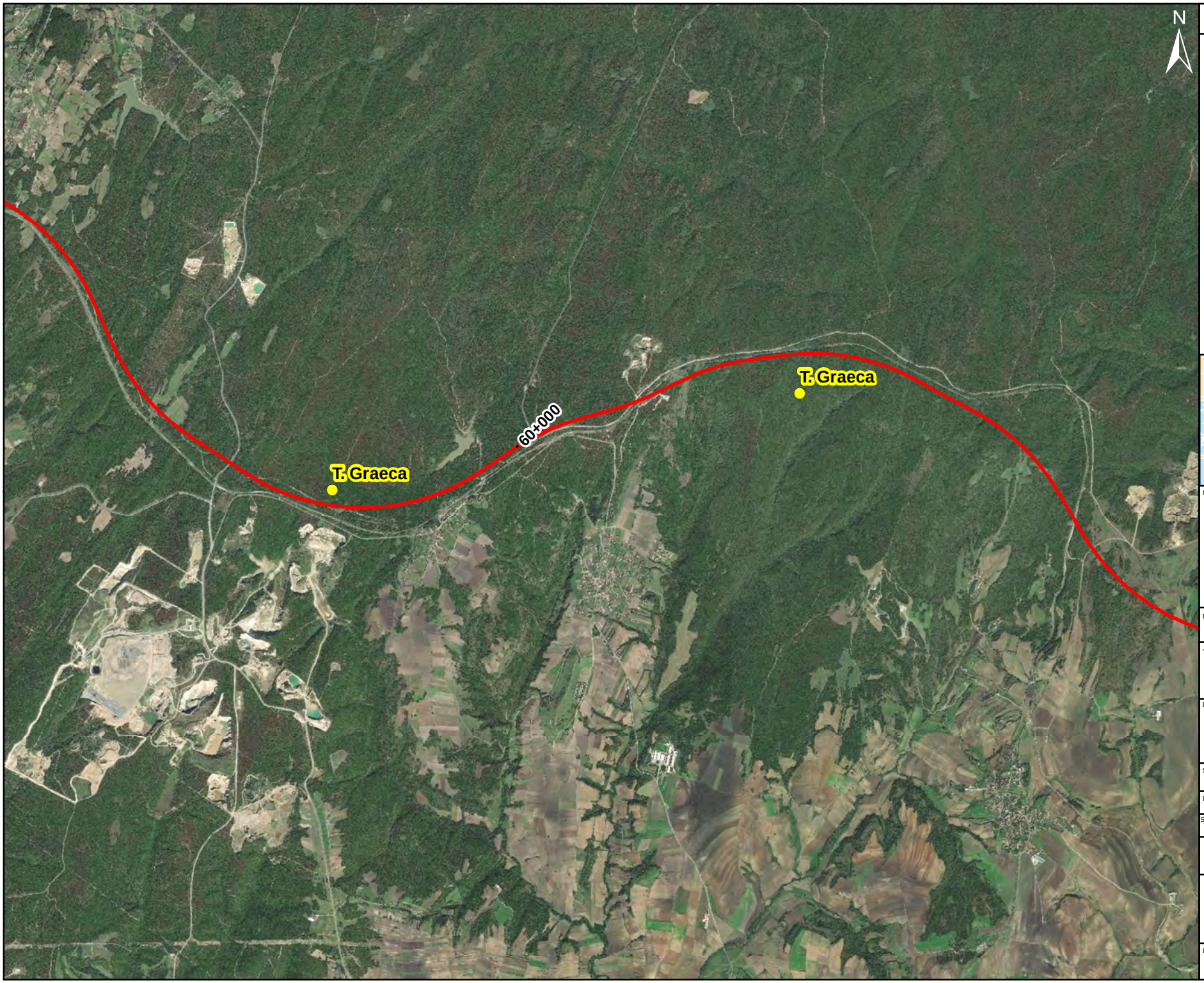
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JS	JW	DG	08/03/2021

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Km

wsp

Drawing Number: Figure B-2

Path: \\uk.wspgroup.com\central data\Projects\70069878xx\70069878 - IPPF - Turkey TCDD Halkali - Cerkezkoy High Speed Railway\03 WIP\GIS\Mxd\Chapter 8 Appendix A Figure B-2 -Confirmed European Ground Squirrel Presence.mxd



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Legend

- Spur-thighed Tortoise Observations
- Proposed Railway Route



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure B-3 - Spur-thighed Tortoise Observations

Scale at A4
1:50,000

Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
JS	JW	DG	08/03/2021

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Drawing Number
Figure B-3

Path: \\uk.wspgroup.com\central data\Projects\70069878xx\70069878 - IPPF - Turkey TCDD Halkali - Cerkezkoy High Speed Railway\03 WIP\GIS\Mxd\Chapter 8 Appendix A Figure B-3 - Spur-thighed Tortoise Observations.mxd



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Legend

- C. Olivieri Subsp, Istanbulensis Observations
- Proposed Railway Route
- Tunnel (TBM - Double Tube)
- Tunnel (NATM)
- Tunnel (Cut - Cover)



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure B-4 - C. Olivieri Subsp, Istanbulensis Observations

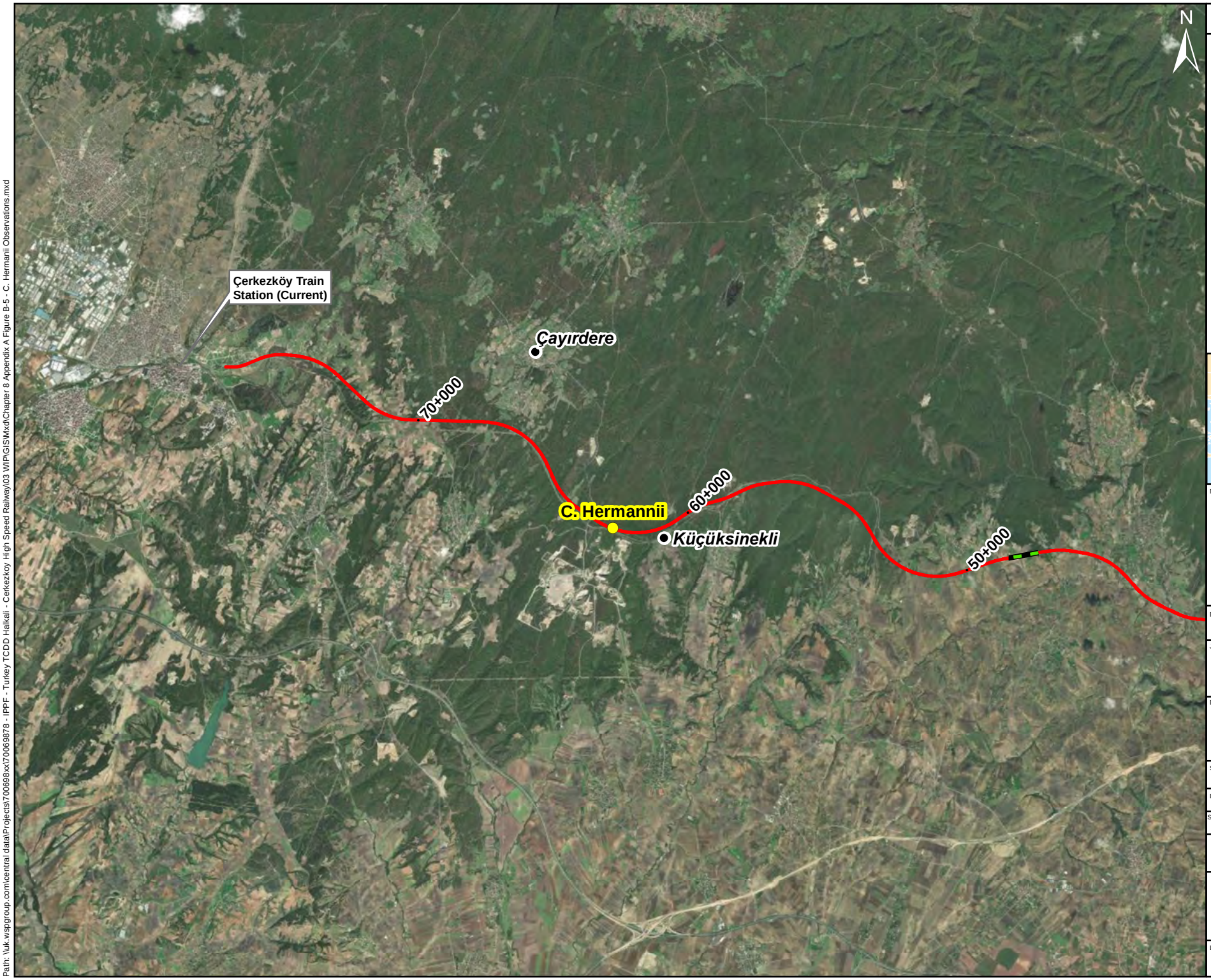
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JS	JW	DG	08/03/2021

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Km

Drawing Number
Figure B-4

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Legend

- Town
- C. Hermannii Observations
- Proposed Railway Route
- Tunnel (Cut - Cover)



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure B-5 - C. Hermanii

Scale at A4: 1:150,000

Drawn			
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Stage 1 check	Stage 2 check	Originated	Date
JS	JW	DG	23/02/2021

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Drawing Number: Figure B-5

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Legend

- Town
- C. Polycephalum Observations
- Proposed Railway Route
- Tunnel (TBM - Double Tube)
- Tunnel (NATM)
- Tunnel (Cut - Cover)



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure B-6 - C. Polycephalum

Scale at A4: 1:200,000

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Stage 1 check	Stage 2 check	Originated	Date
JS	JW	DG	23/02/2021

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Drawing Number: Figure B-6

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Legend

- Town
- C. Pestalozzae Observations
- Proposed Railway Route
- Tunnel (NATM)
- Tunnel (Cut - Cover)



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure B-7 - C. Pestalozzae Observations

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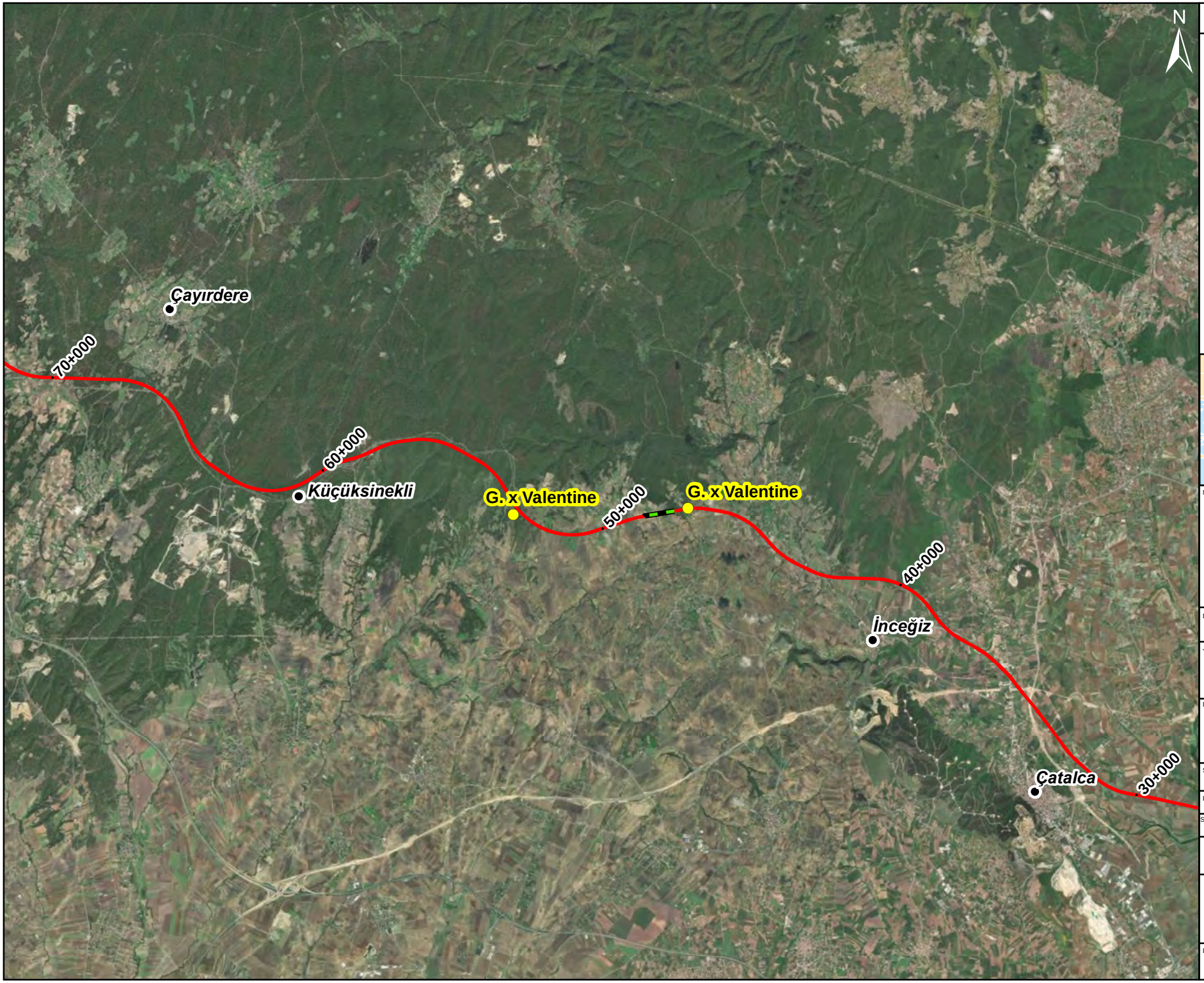
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Km

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Drawing Number: Figure B-7

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Legend

- Town
- G. X Valentine Observations
- Proposed Railway Route
- Tunnel (Cut - Cover)



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure B-8 - G. X Valentine Observations

Scale at A4: 1:150,000

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JS	JW	DG	23/02/2021

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Appendix M

BIODIVERSITY MANAGEMENT PLAN (CHAPTER 8: ECOLOGY)

AYGM

HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Biodiversity Management Plan



70069878
APRIL 2021

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AYGM

HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Biodiversity Management Plan

TYPE OF DOCUMENT (VERSION) CONFIDENTIAL

PROJECT NO. 70069878

OUR REF. NO. 70069878

DATE: APRIL 2021

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QUALITY CONTROL

Issue/Revision	First Issue	Revision 1	Revision 2	Revision 3
Remarks	Draft	Final	Final	Final (Revision 3)
Date				
Prepared By	J. Seller	J. Seller	J. Seller	J. Seller
Signature				
Checked By	R. Gowing C. Beard	R. Gowing C. Beard	J. Warhurst	J. Warhurst
Signature				
Authorised By	R. Bailey	R. Bailey	R. Bailey	R. Bailey
Signature				
Project Number	70069878	70069878	70069878	70069878
Report Number	Revision 0.1	Revision 1.0	Revision 2.0	Revision 3.0
File Reference	Biodiversity Management Plan			

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1.2 REPORT PURPOSE 1
1.3 ONGOING REVIEW 1

2 ROLES AND RESPONSIBILITIES 3

2.1 INTRODUCTION 3

3 BIODIVERSITY MANAGEMENT 6

3.1 INTRODUCTION 6
3.2 AIMS AND OBJECTIVES 6

4 MANAGEMENT ACTIONS 7

4.1 INTRODUCTION 7

5 MONITORING AND ADAPTIVE MANAGEMENT 15

5.1 INTRODUCTION 15
5.2 MONITORING 15
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APPENDIX B

SURVEY & MONITORING REQUIREMENTS

APPENDIX C

CONSTRUCTION PROGRAMME CONSTRAINTS

1 INTRODUCTION

1.1 BACKGROUND

1.1.1. The Turkish General Directorate of the Infrastructural Investment (AYGM) intents to construct a new high-speed rail between Halkali and Cerkezkoy (hereafter the 'Project'), situated in the Marmara region of Turkey. The European Bank for Reconstruction and Development (EBRD) and the Asian Infrastructure Investment Bank (AIIB), collectively called the 'Lenders', are considering financing the Project. The Project has therefore been developed in accordance with the Lenders policy and requirements.

1.1.2. As part of the Project the requirement for a **Biodiversity Management Plan** (**BMP**) has been identified.

1.1.3. The Project is being developed in alignment with EBRD Performance Requirements, including Performance Requirement 6 (PR6) on Biodiversity Conservation and Sustainable Management of Living Natural Resources[1].

1.1.4. This BMP should be read in conjunction with the following reports:

- AYGM Halkali – Cerkezkoy High Speed Railway: **ESIA Chapter 8: Biodiversity**
- AYGM Halkali – Cerkezkoy High Speed Railway: **ESIA Appendix L: Critical Habitat Assessment**

1.2 REPORT PURPOSE

1.2.1. This report provides a framework of mitigation and monitoring commitments that are required to be delivered to ensure the Project remains compliant with PR6[2] and international good practice on biodiversity. These commitments are derived from the outcomes of the Project **Environmental and Social Impact Assessment** (**ESIA**) and **Critical Habitat Assessment** (**CHA**).

1.2.2. This report is a live document throughout construction and operation (until agreed otherwise by Project Lenders) and should be updated to reflect increased understanding of Project programme and design and should also be informed by new information as it becomes available (e.g. as obtained from ongoing/pre-construction surveys or as received from relevant Project stakeholders).

1.3 ONGOING REVIEW

1.3.1. This **BMP** should be finalised as part of delivery of PR6 elements of the **Environmental and Social Action Plan** (**ESAP**). This should be completed prior to commencement of construction activities on

[1] EBRD. 2014. Performance Requirement 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

[2] PR6 requires provision of a BMP to *'…capture all actions necessary to achieve desired project outcomes (such as no net loss/net gain) on biodiversity.'*

the Project. Beyond this, an ongoing review mechanism will be established whereby the **BMP** can be updated to reflect the ongoing biodiversity management as per **paragraph 1.2.2**.

2 ROLES AND RESPONSIBILITIES

2.1 INTRODUCTION

2.1.1. A key component of the successful delivery of this BMP is the full understanding of roles and responsibilities required under this plan. It is the responsibility of AYGM to ensure that all relevant Project staff and contractors adhere to the requirements of the BMP, together with all other relevant obligations as included within the **ESIA**, **CHA** and **ESAP**.

2.1.2. AYGM will be responsible for ensuring the BMP is updated, as required, to ensure its efficacy as the Project develops, and that updates are submitted for approval to the Lenders Technical Advisor (TA) as specified in the **ESMP**. AYGM will engage an appropriate qualified Environmental Supervisor on the Project to facilitate compliance with the BMP. Where necessary, additional technical specialists will also need to be contracted to discharge specific components of the **BMP**, e.g. in relation to botany, ornithology, etc.

2.1.3. An indicative breakdown of roles and responsibilities is included in **Table 2-1** below. This will be updated as the Project design programme is finalised, and critically, once the Contractor has been engaged.

Table 2-1 - Summary of Indicative Roles and Responsibilities

Role	Responsibilities
Project Implementation Unit (PIU)	
AYGM / PIU	▪ Overall responsibility for overseeing: • the implementation of the BMP; • the submission of updates for the ongoing approval of the BMP; • instilling and maintaining strong culture of environmental / biodiversity; • awareness and protection on the Project during construction; and • the overall stakeholder liaison process for the Project. ▪ Responsible for ensuring roles and responsibilities are clearly identified and allocated within the PIU and within the Contractor's (and sub-contractor's) organisations. ▪ Appointing technical specialists to effectively audit the implementation of environmental measures and processes, including an Environmental / Biodiversity Specialist and Community Liaison Officers (CLOs). ▪ Ongoing and regular weekly liaison with the Environmental Lead on the Project to remain informed on performance during construction. ▪ Provision of recommendations to address any non- compliance identified during construction. ▪ Monthly reporting to the Project Lenders during construction.
PIU Manager	▪ Ultimately responsible for overseeing the activities undertaken by the PIU specialists, overseeing the implementation of mitigation measures and management procedures specified within the disclosure package of the

Role	Responsibilities
	Project, and overseeing the preparation and implementation of **CESMP** and **OESMP** (as detailed in the **ESMP**).
Environmental / Biodiversity Specialist	▪ Embedded within the Project Implementation Unit and will be responsible for ensuring the specified 2021 surveys are implemented, and the BMP is refined, for inclusion in the Contractors tender package. ▪ Will oversee the Contractors delivery of the BMP, once they are appointed. ▪ Review delivery of the BMP with regards overall compliance against Lender requirements, national legislation, etc. ▪ Liaise with the PIU CLOs to undertake and assist with relevant stakeholder consultation ▪ Undertake regular liaison with the Contractors Environmental Lead and ECoW to ensure general biodiversity good practice on the Project during construction ▪ Recommend measures to address areas of non-compliance and monitor their implementation. ▪ Support AYGM in the provision of internal capacity building and environmental training within the PIU. ▪ Provision of monthly environmental reports, including BMP updates, when required, to the Lenders during construction.
Supervision Consultant's Environmental Expert	▪ Responsible for supervising the Contractor to ensure that recommendations and requirements, as set out in the BMP are applied. ▪ Responsible for continuous monitoring of the processes and activities undertaken by the Contractor, and specifying measures to be implemented by the Contractor, to address any areas of non-compliance.
Contractor	
Contractor	▪ Responsibility for: • the implementation of the BMP during construction; • updating the BMP during construction; • programming and overseeing the pre-construction surveys; • instilling and maintaining strong culture of environmental / biodiversity awareness and protection on the Project site during construction; and • stakeholder liaison. ▪ Appointing technical specialists including an Environmental Lead and Ecological Clerk of Works (ECoW). ▪ Ensuring the provision of regular reporting to the PIU Environment / Biodiversity Specialist on the Project, to ensure they remain informed on performance during construction. This will include data to inform the monthly reporting to the Project Lenders.
Environmental Lead	▪ Point of contact between the Contractor and technical specialist(s) appointed to undertake pre-construction surveys or provide ad hoc support. ▪ Manage capacity building across the Project team(s).

Role	Responsibilities
	▪ Manage training programme across the Project to ensure all operatives receive up to date training as required to effectively deliver the BMP during construction. ▪ Manage incident reporting and adaptive management in response to incidents (as required) during construction. ▪ Document incidents as they occur and report to the Environmental Expert. ▪ Provision of data to the Environmental Expert to inform monthly reporting.
Ecological Clerk of Works (ECoW)	▪ Work with the Environmental Lead to ensure general biodiversity good practice on the Project. ▪ Undertaking daily inspections / review of works areas, especially with regards construction good practice (e.g. animal welfare, pollution control etc.) during construction. ▪ Site supervision and watching briefs. ▪ Provision of toolbox talks. ▪ Provision of ad hoc advice regarding biodiversity sensitivities during construction, including advice on micro-siting of works. ▪ Oversee any removal of animals, if required. ▪ The ECoW will have the authority to stop works at any point should they consider that the potential ecological impacts associated with a particular activity are unacceptably high. ▪ Input to monthly reporting.
Lenders	
Lenders	▪ Provide advice on environmental aspects of the Project, and approvals.
TCDD Transport	
TCDD Transport (Operation)	▪ Overall responsibility for overseeing: • The implementation of the operational aspects of the BMP, including operational monitoring. ▪ Quarterly environmental and social reporting to the Project Lenders during Project operation, including progress on BMP implementation.

3 BIODIVERSITY MANAGEMENT

3.1 INTRODUCTION

3.1.1. This section provides details of the outline aims of this **BMP** together with objectives required to be met in order to deliver these aims.

3.2 AIMS AND OBJECTIVES

3.2.1. **Table 3-1** below lists the aims and objectives that form the basis of the **BMP**. These will be subject to change as required through ongoing management of the **BMP**.

Table 3-1 - BMP Aims and Objectives

Aim Ref.	Description	Associated Objective(s)
1	To prevent adverse impacts to integrity of any Protected Areas.	1a: Reduce collision risk to those qualifying bird species and assemblages associated with the protected areas. 1b: Restore/compensate habitats lost to the Project from within the Protected Areas
2	To achieve no net loss or net gain (as required) of important biodiversity during construction.	2a: Minimise loss of important habitats. 2b: Achieve no net loss of oak-hornbeam woodland. 2c: Minimise impacts to important flora 2d: Achieve a net gain in the population of *Centaurea hermannii* and *Lathyrus undulatus* 2e: Manage risk of introduction or spread of invasive species. 2f: Minimise impacts to important fauna. 2g: Achieve a net gain for white-headed duck Critical Habitat
3	To minimise impacts to biodiversity during construction.	3a: Maintain good practice animal welfare measures. 3b: Maintain connectivity between fragmented habitats. 3c: Protect the aquatic environment during in-channel works.
4	To minimise impacts to biodiversity during operation.	4a: Minimise impacts to important fauna 4b: Manage risk of introduction or spread of invasive species. 4c: Maintain good practice animal welfare measures. 4d: Maintain connectivity between fragmented habitats.
5	To enhance biodiversity	5a: Enhancement biodiversity within the Project expropriation corridor.

4 MANAGEMENT ACTIONS

4.1 INTRODUCTION

4.1.1. This section presents the biodiversity management actions and targets required to be delivered the Aims and Objectives listed within **Section 3**. These actions are indicative at this stage and will reviewed / refined by AYGM as part of the finalising process for the BMP (and to the approval of the Lenders TA). In particular, drawings which illustrate the spatial extent of the implementation of the **BMP** will be required.

4.1.2. The actions and targets for each Aim and Objective are presented chronologically within **Table 4-1**.

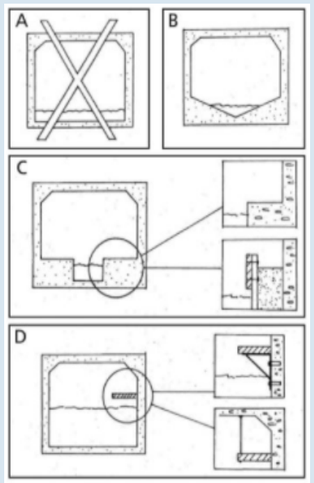
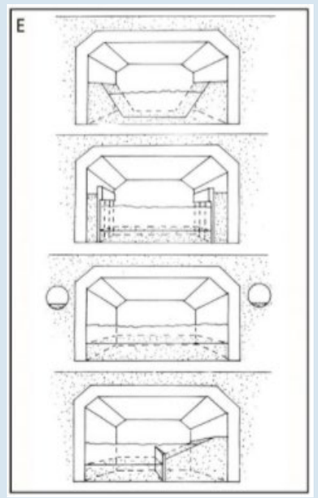
Table 4-1 - BMP Actions

Aim	Objective	Action	Target	Responsibility
1	1a	1a(i): Screening at flight activity 'hot-spots' with adapted Project fencing. Poles will be erected at 1m intervals, increasing the height of the Project fencing to 3m to minimise flight activity at potential collision height (PCH). Each pole will also be fitted with red/white ribbon to further divert bird flights upwards. Adapted fencing should be provided (at present and to be updated following additional survey work) at the following chainage locations: ▪ 0+000 to 1+000 ▪ 7+000 to 8+000 ▪ 25+000 to 30+000 Where ongoing monitoring identifies this measure as not being wholly successfully, the height of the screening should be increased accordingly.	Adapted fencing should be in place prior to the Project becoming operational. The action will be considered successful should operational monitoring confirm no significant impacts to IBA bird populations as a result of collision mortality.	Contractor (adapted fencing) TCDD Transport (monitoring)
		1a(ii): As required, more innovative mitigation measures should be explored where Action 1a(i) is not possible or proved successful. This may include train speed management/restrictions at collision 'hot spots' as a last resort measure.	Train speed management should be adopted immediately upon operation of the Project as required. The action will be considered successful should operational monitoring confirm no significant impacts to IBA bird populations as a result of collision mortality.	AYGM
	1b	1b(i): Restoration of habitat to the north of Büyükçekmece Lake where the Project bisects the IBA. Where this is not possible post-construction, an equivalent area of habitat should be improved within the IBA further south (e.g. to the immediate south of the feeder channel to the east of Catalca). This measure will be included within a **Habitat Restoration Plan** (HRP) to be produced for the Project in advance of construction, delivered as part of the BMP and as specified in the **ESAP**	Restoration should occur post-construction. This action will be considered a success once habitat restoration/compensation has been completed and monitoring has confirmed its successful establishment.	AYGM
2	2a	2a(i): Micro-siting of construction activities to avoid the most sensitive habitats/features on the ground. This will be undertaken by the Project ECoW and informed by findings from pre-construction surveys in advance of construction activities. Micro-siting should include (but is not limited to) avoidance of the following features: ▪ Mature trees; ▪ Hedgerows and/or other green corridors; and ▪ Natural/semi-natural habitats: woodland, wetland, scrub, shrubland, lowland meadows.	Micro-siting will be an ongoing process during construction. The action will be considered successful should pre-identified areas of increased biodiversity value be avoided and/or protected during construction; confirmed through post-construction monitoring.	Contractor
	2b	2b(i): A detailed botanical survey of the currently classified G1.A oak-hornbeam habitat type will be undertaken across areas where this habitat will be lost. This will inform the **HRP**. This survey (and all recommended pre-construction survey effort) is summarised within Appendix B. 2b(ii): An **HRP** will be produced. This will include the trees and associated flora required to recreate the G1.A habitat lost to construction. This planting should be located within an area where it will be afforded long-term protection and at a level that ensures at least like-for-like replacement of the area lost. At present, it is assumed that the large expanse of coniferous forest north of İnceğiz will be a suitable replanting location given its size and proximity to G1.A habitat (see Figure B-1 within Appendix	Survey effort should be undertaken during an appropriate growing season (i.e. spring 2021) by a suitably experienced botanical surveyor. Compensatory planting will need to be approved as part of the overall landscape/planting plan approval process. The planting will be considered a success once the woodland habitat has become established, as identified through monitoring.	AYGM

Aim	Objective	Action	Target	Responsibility
		B). This should be formalised through discussions with AYGM and the State Forest Department and detailed within the **HRP** to the approval of the Project Lenders.		
	2c	2c(i): Micro-siting of construction activities to avoid the most sensitive flora. This will be undertaken by the Project ECoW / Environmental Lead and informed by findings from pre-construction surveys in advance of construction activities to accurately map the location of rare plant species. The species to be considered currently comprises the following: ▪ Rare plants: *Cirsium poycephalum, Centaurea hermannii, Crocus olivieri* subsp. *Istanbulensis*, *Crocus pestalozzae, Galanthus x valentinei* and *Ferulago confuse.*	Micro-siting will be an ongoing process during construction. The action will be considered successful should pre-identified rare plants/assemblages be avoided/protected during construction; confirmed through post-construction monitoring.	Contractor
		2c(ii): Individuals of the species identified in 2c(i) (excluding *C. hermannii*) will be collected where residual risk of their loss remains. These individuals will be translocated outwith the Project footprint to suitable habitat where the plants will be able to become established in the long-term. This should be done in consultation with (or overseen by) suitably experienced botanists (such as representatives of Nezahat Gokyigit Botanical Gardens). Receptor sites should be chosen based on their long-term protection; at present it is assumed that these will comprise land owned by the State Forest Department. Details in this regard should be provided within the Project **HRP**.	Plants will be translocated pre-construction, In combination with 2c(iii) this action will be considered successful once a population of at least the current ZoI estimate has become established. Where possible an increase in the number of specimens should be targeted.	AYGM (for the production of the **HRP**) Contractor for implementation
		2c(iii): Seeds of the species identified in 2c(i) (excluding *C. hermannii*) will be collected and propagated by suitably experienced botanists (such as representatives of Nezahat Gokyigit Botanical Gardens). The resulting plants will be planted in appropriate locations across the Project ZoI. Receptor sites should be chosen based on their long-term protection; at present it is assumed that these will comprise land owned by the State Forest Department. Details in this regard should be provided within the Project **HRP**.	In combination with 2c(ii) this action will be considered successful once a population of at least the current ZoI estimate has become established. Where possible and increase in the number of specimens should be targeted.	AYGM (for the production of the **HRP**) Contractor for implementation
	2d	2d(i): Individual specimens of *Centaurea hermannii* and *Lathyrus undulatus* (if encountered) will be collected where residual risk of their loss remains. These individuals will be translocated outwith the Project footprint to suitable habitat where the plants will be able to become established in the long-term. Receptor sites should be chosen based on their long-term protection; at present it is assumed that these will comprise land owned by the State Forest Department. Details in this regard should be provided within the Project **HRP**.	In combination with 2d(ii) this action will be considered a success once an overall population of twice the current estimated population has become successfully established. This will be confirmed through ongoing monitoring.	AYGM (for the production of the **HRP**) Contractor for implementation
		2d(ii): Seeds of *C. hermannii* and *Lathyrus undulatus* (if encountered) will be collected and propagated by suitably experienced botanists. The resulting plants will be planted in appropriate locations across the Project ZoI. Receptor sites should be chosen based on their long-term protection; at present it is assumed that these will comprise land owned by the State Forest Department. Details in this regard should be provided within the Project **HRP**.	In combination with 2d(i) this action will be considered a success once an overall population of twice the current estimated population has become successfully established. This will be confirmed through ongoing monitoring.	AYGM (for the production of the **HRP**) Contractor for implementation
		2d(iii): A **Biodiversity Action Plan** (BAP) will be produced for *C. hermannii* and *Lathyrus undulatus* (if encountered) given its status as a Critical Habitat trigger	The **BAP** must be 'live' and adopted in advance of construction.	AYGM

Aim	Objective	Action	Target	Responsibility
		species. The **BAP** will be a standalone document that fully details the mitigation management and commitments required for this species in order that the Project remains compliant with PR6. The **BAP** will be a dynamic and collaborative document in which all relevant stakeholders are actively involved in perpetuity. The **BAP** will cross-reference the **HRP** where appropriate.	This action will be considered a success once the **BAP** has been approved by the Lenders TA.	
	2e	2e(i): An **Invasive Species Management Plan** (ISMP) will be produced that details measures required to manage any risk of the introduction/spread of invasive species during construction of the Project. The **ISMP** must be adhered to at all times by the contractor, and all sub-contractors. The ECoW will oversee its delivery during construction.	The **ISMP** will be produced and approved in advance of any construction activities. This action will be considered a success once construction has been completed and invasive species have been prevented from being introduced/spread during construction activities.	AYGM
	2f	2f(i): Micro-siting of construction activities to avoid the most sensitive fauna including associated habitats/features (e.g. their places of shelter) where practical. This will be undertaken by the ECoW (with support from technical specialists as required) and informed by findings from pre-construction surveys. Micro-siting should include (but is not limited to) avoidance of the following features: ▪ European ground squirrel burrows and burrow complexes ▪ Marbled polecat burrows ▪ Other burrows, places of shelter used by fauna ▪ Bat roosts ▪ Reptile hibernacula/shelters (including those of the spur-thighed tortoise) ▪ Eastern imperial eagle nest site(s) ▪ All bird nests Micro-siting should also consider disturbance and therefore be applied to achieve a distance around sensitive receptors at which no significant disturbance response will be elicited. Suitably experienced technical specialists will need to be consulted to advise on appropriate distances for the different receptors identified/confirmed during pre-construction walkovers. The ECoW will be responsible for overseeing adherence to these buffer distances. Where micro-siting is not possible, the ECoW will advise on an appropriate course of action to ensure impacts to sensitive biodiversity are minimised. This may include (but is not restricted to) the following: ▪ Exclusion buffer (of a distance considered appropriate by the ECoW) around sensitive features when in use (e.g. active bird's nest). ▪ Watching brief of sensitive receptors to monitor disturbance response, with the ECoW given authority to stop works as appropriate (explicitly in the case of imperial eagle and for other species at the discretion of the ECoW). ▪ Enabling works (e.g. vegetation clearance) in advance of works to avoid seasonally present, sensitive receptors from being present during construction. ▪ Provision of animal/bird deterrents to reduce the risk of sensitive biodiversity returning/being present within an area subject to disturbance. ▪ Pre-construction searches and local translocation of sensitive fauna such as reptiles and amphibians. ▪ Provision of artificial bat roosts where it has not been possible to avoid loss/disturbance to an existing roost during construction. Such features should be in place in advance of construction and their locations informed by pre-construction surveys. The ECoW/suitably experienced specialist will translocate any bats	Micro-siting will be an ongoing process during construction. In combination with 2f(ii), this action will be considered a success should pre-identified sensitive fauna be avoided/protected during construction; confirmed through post-construction monitoring as well as watching briefs.	Contractor

Aim	Objective	Action	Target	Responsibility
		present bats to artificial roost sites immediately prior to relevant construction activities. Note: this should be done by a suitably experienced bat-worker given the potential for disease transmission when handling bats.		
		2f(ii): Works should be timed to avoid periods of greatest receptor sensitivity. In particular this applies to birds while they are nesting and as such construction activities around important nest sites/nesting habitat (as informed through pre-construction surveys) should be timed to avoid the months March-June inclusive). Complementing this, targeted avoidance of construction activities from November to early-March should also be adopted where possible around Büyükçekmece Lake. This should take priority over avoidance of the nesting season here. The ECoW (along with appropriate technical specialists, such as ornithologists, as required) should advise the Contractor (who will advise the Project programmers) of works locations where sympathetic timing should be incorporated. A summary table of programme considerations in this regard is provided within Appendix C.	Sensitive timing of works will be undertaken throughout construction. In combination with 2f(i), this action will be considered a success should pre-identified sensitive fauna be avoided/protected through sensitive timing of works; confirmed through construction and post-construction monitoring. This is explicitly applicable to imperial eagle, white-headed duck and waterbirds associated with Büyükçekmece Lake given their elevated PR6 status.	Contractor
		2f(iii): Crossing points/trenches will be installed at targeted locations within the Project as informed by current findings and findings from pre-construction surveys. At present, the following chainages are considered to be most important in terms of underpass installations: ▪ Between chainages 7+000 and 8+000. ▪ Between chainages 19+000 and 27+000. ▪ Between chainages 34+000 and 38+000. The above installations will be complemented with fencing either side which will have the dual purpose of minimising crossing attempts over the live tracks and also directing animals to the underpasses to maximise their use. A dedicated crossing points plan should be produced by AYGM (to the approval of the Project Lenders) in advance of construction activities. The ECoW will be responsible for overseeing successful installation. In addition, mammal ledges will be installed within culverts at the following change locations: ▪ Between chainages 22+000 and 30+000. ▪ Between chainages 39+000 and 42+000. ▪ Between chainages 53+000 and 69+000. In all cases, the underpasses should be designed/installed to ensure they are available for use all year round, in particular this means avoiding any areas prone to flooding (see **ESIA Chapter 11: Surface Water Environment**); ideally the underpass should be located on an embankment to overcome such issues. Other design recommendations are as follows: ▪ Underpass diameter of around 1.5m to make it accessible for a variety of animals (and to aid ongoing maintenance) ▪ Rectangular tunnels are preferred, with prefabricated concrete structures suitable ▪ The bottom of the tunnel/structure should be filled with a natural substrate (e.g. sand, rocks) to provide a horizontal movement surface ▪ A minimum gradient of 1% should be achieved where any waterlogging risk exists	Installation of appropriate crossing points will be completed during construction. This action will be considered a success should installations be readily used by animals crossing the railway and should collision mortality of sensitive fauna be avoided as a result; confirmed through operational monitoring.	Contractor

Aim	Objective	Action	Target	Responsibility
		▪ The tunnel should be located within a recess in the fenceline to guide animals to them As an additional measure to the above, culverts adapted with the dual purpose of allowing safe passage by small animals will be used. This is achieved by using a culvert design that has dry passage beneath the railway at all times (e.g. as achieved through ledges). Indicative designs for such a structure are included in **Figure 2f** overleaf.   **Figure 2f - Adapted Culvert Design Options**[3] 4.1.6. Further to the above, where adapted culverts are not feasible, modifications will be made to the designs of watercourse crossings to incorporate mammal ledges to facilitate safe movement along watercourses at targeted locations (most notably where the potential exists for otter to be present). Specifically, these are between chainages: 0+000 to 1+000; 7+000 to 15+000; 22+000 to 24+000; 26+000 to 28+000; and 54+000 to 65+000. As above, the specifics of this measure should be updated through delivery of the **BMP** as part of the **ESMP**.		
	2g	2g(i): The Project will make a material contribution to the ongoing management of both Büyükçekmece Lake and Küçükçekmece Basin for the benefit of birds, in particular white-headed duck. The specifics of such a contribution should be agreed in advance of construction activities and informed through consultation with relevant stakeholders (e.g. Doga) and should include, as a minimum, material support in the production of a **White-headed Duck Management Plan** for Büyükçekmece Lake and Küçükçekmece Basin. Both sites are currently under some level of conservation management, although it has been recognised that capacity and resource is a limiting factor to this management.	Financial support or provision of personnel time to assist with conservation management in line with ongoing conservation initiatives at the two sites. This action will be considered a success once conservation management as contributed to by the Project has been undertaken; AYGM should report on progress on an annual basis from the start of this support and relevant stakeholders (e.g. Doga) should be invited to input to such reporting.	AYGM

[3] Iuell. B. 2003. Wildlife and Traffic: A European Handbook for Identifying Conflicts and Designing Solutions

Aim	Objective	Action	Target	Responsibility
		With this in mind, it is wholly feasible that Net Gains can be secured as a result of input from the Project. The above initiative will be detailed within the Project BAP, to the approval of the Project Lenders.		
3	3a	3a(i): Good practice animal welfare measures should be adopted throughout construction. These should include (but are not limited to): ▪ Catenary wire supporting structures/tubes should be capped throughout the Project to prevent animals accessing these structures and becoming trapped ▪ Securing active construction sites to minimise risk of harm/trapping ▪ Minimising the use and spread of lighting ▪ Limiting vehicle movements and speed ▪ Toolbox talks All of the above will be the responsibility of the ECoW to oversee.	Good practice animal welfare measures should be adopted throughout construction. The action will be considered a full success if high animal welfare standards are maintained through constructions, as confirmed through ECoW observations/monitoring.	Contractor
	3b	3b(i): Retention of connecting/green corridors should be achieved as per measures described within 2a(i). Furthermore, the planting described within 1a(i) should be designed to provide connectivity within the wider landscape where possible. Planting should make use of species of local/regional provenance.	Retention/restoration of green corridors will be undertaken during construction. This action will be considered a success once all features agreed as part of the landscaping/planting plan have become successfully established.	
	3c	3c(i): Construction work should adhere to the best practice pollution prevention guidance outlined by the Construction Industry Research and Information Association guidance[4]. Specific measures are not limited to, but must include the following: ▪ Construction materials should be stored and maintained away from watercourses. Silt fences or similar should be placed around exposed ground and stockpiles, and early revegetation of the completed elements of the scheme should be undertaken to reduce further erosion. ▪ Surface water runoff from the construction sites into the watercourses should be avoided and a system of cut-off ditches, silt fencing and/or bunds should be installed if required. ▪ Chemicals and fuels should be stored in secure containers located away from watercourses or water bodies. No refuelling of plant of machinery should take place near the watercourse. ▪ Noise and vibration should be controlled and kept to the minimum necessary to prevent potential negative effects on fish. ▪ Lighting used for construction should be switched-off when not in use and, where possible, positioned so as not to spill on to watercourses.	Aquatic environment protection measures should be adopted throughout construction. The action will be considered a full success if protection of the aquatic environment is maintained through constructions, as confirmed through ECoW observations/monitoring.	Contractor

[4] CIRIA (2015). Environmental good practice on site (fourth edition) (C741). Charles, P., Edwards, P. (eds). CIRIA, London.

Aim	Objective	Action	Target	Responsibility
		Should any part of a watercourse need to be impounded during the works, then a fish translocation should be carried out to remove fish from the impoundment. Expert advice must be sought by the ECoW in advance of any translocation requirement. Biosecurity measures will be implemented during the construction phase to prevent the spread of invasive non-native species (INNS). Biosecurity is defined as a set of precautions that aim to minimise the risk of moving non-native species, parasites and diseases. Measures must include: ▪ The briefing and training of workers on good biosecurity practices appropriate to their role. ▪ Equipping workers with the necessary equipment, Personal Protective Equipment (PPE) and materials to implement biosecurity control measures. This will most frequently comprise disinfectant tablets, sprayers and brushes to clean and disinfect equipment and PPE prior to leaving site. Should any dead or visibly injured fish be observed during construction the Contractor should stop works and notify the ECoW immediately. The Contractor will not continue works until the ECoW has confirmed that it is acceptable to do so.		
4	4a	4a(i): Adapted fencing around flight activity hotspots should be achieved as per action 1a(i) but extending to species of requisite sensitivity outwith the IBA; at present this comprises imperial eagle. The exact nature and extent of this action will be informed by ongoing survey effort and detailed within this BMP to be approved by the Project Lenders.	Adapted fencing should be in place prior to the Project becoming operational. The action will be considered successful should operational monitoring confirm no significant impacts to bird populations as a result of collision mortality.	Contractor (fencing) TCDD Transport (monitoring)
	4b	4b(i): See 2e(i).	-	-
	4c	4c(i): Anti-perching structures should be installed upon catenary structures within sections considered to pose a risk to imperial eagles, based upon results from surveys undertaken in 2021.	Anti-perching structures should be installed prior to the Project becoming operational. The action will be considered successful should operational monitoring confirm no significant impacts to imperial eagle populations as a result of electrocution.	Contractor (anti-perching structures) TCDD Transport (monitoring)
5	5a	5a(i): Planting of native plants (of local provenance where possible) should be undertaken across the expropriation corridor. Planting should consist of low-growing species (e.g. herbaceous plants) to minimise/dissuade use by nesting birds. Particular focus should be on species that are attractive to invertebrate species. This action should be developed in consultation with relevant stakeholders, such as Nezahat Gokyigit Botanical Gardens. Note: No planting of tall shrubs or trees is proposed within the 50m railway corridor for the project (25m either side of the centreline of the Project). This is to avoid disruption from potential vegetative contact with the power supply and catenary posts.	Successful planting across relevant areas of the restored expropriation corridor.	Contractor

5 MONITORING AND ADAPTIVE MANAGEMENT

5.1 INTRODUCTION

5.1.1. This section presents a summary of the provisional monitoring requirements required to be delivered under the **BMP**, together with the pathways to inform adaptive management on the Project. This section will need to be finalised once the rest of the **BMP** is complete in order to ensure an effective monitoring strategy is adopted.

5.1.2. Monitoring is limited to survey work collected during construction and operation. Survey work undertaken pre-construction (and used to inform the **BMP**) is not considered here.

5.2 MONITORING

BIRD SURVEYS

5.2.1. Bird surveys will be split into construction and operational monitoring. Surveys will be completed by suitably experienced ornithologists, preferably one with experience of the Project to date.

5.2.2. Construction monitoring will comprise survey effort undertaken around key ornithological sensitivities to identify the potential for significant disturbance to occur. In terms of individual species, this is considered to be limited to monitoring imperial eagle nest sites at this stage. Additional monitoring around all nest sites (where sufficient avoidance through timing of works/micro-siting has not been possible) will also be undertaken as advised the ECoW.

5.2.3. Operational monitoring will comprise flight activity surveys at pre-identified areas of highest potential risk (currently for waterbirds around east of Küçükçekmece Basin and around the channel north of Büyükçekmece Lake, and in the vicinity of the imperial eagle territory identified). Ongoing consultation with Doga will inform the need to extend these surveys to other areas (e.g. around other imperial eagle nest sites). Surveys will be completed during migration and overwintering periods for waterbirds and during the breeding season for imperial eagle and will monitor the success of mitigation designed to prevent birds from crossing the railway at PCH.

5.2.4. Bird survey effort should follow methods already deployed on the Project (e.g. in line with methods described within SNH 2017[5]).

5.2.5. Additional operational monitoring will comprise survey effort to record collision mortality. While some of this will be picked up through the flight activity monitoring described above, carcass searching will provide further information on bird mortality. Carcass searching should be focussed around areas where mitigation to minimise collision risk is being implemented, most notably at the following chainages:

- 0+000 to 1+000.
- 7+000 to 8+000.

[5] SNH. 2017. Recommended bird survey methods to inform impact assessments of onshore wind farms.

- 25+000 to 30+000.

5.2.6. Additional locations for operational monitoring may become apparent as pre-construction work progresses and will be reported within the BMP.

5.2.7. Carcass searching should be done in line with strict health and safety controls and only where demonstrably safe to do so and in accordance with a formal health and safety risk assessment.

BOTANICAL SURVEYS

5.2.8. The Environmental Supervisor will ensure that botanical surveys are undertaken by a suitably experienced botanist, preferably one that has been involved on the Project to date. Surveys will be undertaken on an annual basis within the appropriate flowering seasons for the six rare plant species confirmed as being present at the Project site and which will be subject to targeted translocation of individual plants.

5.2.9. Botanical surveys will also include a check of areas subject to compensatory planting/restoration required to mitigate losses to oak/hornbeam woodland and habitat within the Büyükçekmece Lake IBA. Surveys will include (but are not limited to) the following:

- Planting success (i.e. continued presence of saplings, etc.); and
- Evidence of degradation/damage, e.g. from herbivores.

5.2.10. Given the timescales required to monitor success (or otherwise) of this mitigation, the monitoring surveys will be undertaken on an annual basis for the first five years initially. Monitoring beyond this point should then be reviewed and tailored according to the conditions at this point but as a minimum should be no less frequent than every three years until such time that the rare plants have become fully established and show evidence of naturally increasing their numbers, and the woodland habitat has become fully established.

GENERAL BIODIVERSITY WALKOVERS

5.2.11. The Environmental Engineer (Construction) and TCDD Transport (Operation) will ensure that general biodiversity walkovers will be completed with decreasing frequency from the start of construction and then restarting once the Project is operational. These surveys will be undertaken by a suitably experienced ecologist, preferably one that has been involved in the Project to date. Findings from the walkovers will inform changes required to this BMP in terms of adaptive management and adapted operational mitigation.

5.2.12. Surveys of the chainages listed within 2f(iii) will be undertaken, comprising monthly walkovers during the first year (Year 1) of operation, and then with decreasing frequency (to be confirmed following Year 1 surveys). Additionally, should any areas of increased perceived collision risk significance be identified during pre-construction surveys, these will be added to this monitoring component.

5.2.13. Survey effort will comprise monitoring of these areas to assess the adequacy of the mitigation, and inform any amendments required to ensure continued efficacy of these measures. Surveys will include a search for animal carcasses (in particular those of higher significance species (as per the ESIA) such as European ground squirrel, marbled polecat, spur-thighed tortoise, otter, etc.) along the railway within these pre-identified sections, with carcasses identified to species level where possible.

5.3 REPORTING

5.3.1. Monitoring survey outcomes and associated recommendations to update this **BMP** will be reported to the Project Lenders TA on a monthly basis.

5.4 ADAPTIVE MANAGEMENT

5.4.1. Adaptive management will be informed by findings from the monitoring described above. Where it is identified that targets associated with the **BMP** actions are not being met, AYGM (Construction) / TCDD Transport (Operation) will be responsible for rectifying this through appropriate adaptive management, to the approval of the Project Lenders. As a brief indication of what this may comprise, the following measures could feasibly be deployed:

- Increased fauna crossing points installations;
- Increased planting, and/or refined planting locations;
- Supplementary seed-collection and plant propagation;
- Targeted limits on train speeds; and
- Increased INNS management.

5.4.2. Although not currently considered required, additional, measures may be required to address issues associated with birds nesting on catenary structures. Any such initiative should be informed by appropriate survey effort to identify where nests are being established.

Appendix A

IMPACT ASSESSMENT SUMMARY

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Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
Protected Areas	There are three IBAs crossed by the Project.	Construction	Habitat Loss Disturbance	Neutral to Minor (Not Significant)	Compensatory planting of oak-hornbeam woodland. ECoW Sympathetic timing of works	Neutral (Not Significant)
		Operation	Disturbance Collision Mortality	Neutral (Not Significant) to Moderate (Significant)	Adapted fencing to divert flying birds. Limiting train speeds.	Minor (Not Significant)
Habitats	A mixture of agriculture, woodlands/scrub and built-up areas across the ZoI. Includes an area of higher sensitivity oak-hornbeam woodland.	Construction	Habitat Loss	Minor (Not Significant)	Micrositing to avoid areas of greatest biodiversity interest. Compensatory planting of oak-hornbeam woodland to ensure no net loss for this habitat.	Neutral (Not Significant)
Rare Plants	Common and widespread floral assemblage across the ZoI. Six rare plant species (including five endemics) recorded from across the ZoI. One species *Centaurea hermannii* assessed as a Critical Habitat trigger species.	Construction	Loss of Plants Spread of Invasive Species	Moderate to Large (Significant)	Translocation of plants and propagation of individuals to increase overall numbers. Invasive Species Management Plan. ECoW.	Minor Beneficial (Not Significant)
Notable Fauna	Notable species of increased conservation value include European ground squirrel, marbled polecat, bat species and spur-thighed tortoise.	Construction	Disturbance Injury/Mortality	Minor (Not Significant)	Micrositing to avoid areas of greatest biodiversity interest. ECoW	Minor (Not Significant)
		Operation	Disturbance Collision Mortality	Minor (Not Significant)	Maintaining habitat connectivity and reducing collision risk through trench installation.	Neutral (Not Significant)
General Fauna	Common and widespread faunal assemblage across the site but including some species of slightly elevated conservation such as fire-bellied toad.	Construction	Disturbance Injury/Mortality	Minor (Not Significant)	Micrositing to avoid areas of greatest biodiversity interest. ECoW	Minor (Not Significant)
		Operation	Disturbance Collision Mortality	Minor (Not Significant)	Maintaining habitat connectivity and reducing collision risk through trench installation.	Neutral (Not Significant)
Birds	Common and widespread bird assemblage across the study areas. Notable/threatened species include white-headed duck, imperial eagle, common pochard and red-breasted goose.	Construction	Disturbance Injury/Mortality	Moderate (Significant)	Targeted bird surveys. Flight activity surveys. Timing of works.	Minor (Not Significant)
		Operation	Disturbance Collision Mortality	All species, excluding the imperial eagle – Minor (Not Significant)	Adapted fencing to divert flying birds.	Minor (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
				Imperial eagle – Large (Significant)		

Appendix B

SURVEY & MONITORING REQUIREMENTS

Confidential

Table B-1 - Indicative ongoing survey requirements

Survey	Outline Methods	Timing[6]
Rare plants	Botanical survey within suitable habitat to identify all rare plants (of the six species identified and *Lathyrus undulatus*) requiring translocation.	During growing season (March to June) in 2021.
European ground squirrel	Walkover survey to identify burrows of European ground squirrel across habitat within chainages 6+000 and 8+000.	During main active season in 2021 (broadly March to April).
Rare animals	Walkover survey across woodland/scrub habitat in/around the Terkos Basin KBA. Surveys to focus on identifying key sensitivities such as bat roosts, marbled polecat dens and at watercourse crossing locations for otter shelters.	During broad active season in 2021 (March to July).
Birds – spring migration	Vantage Point (VP) surveys at the four VP locations surveyed during August/September 2020 repeating methods deployed here.	Monthly surveys, March to May 2021 inclusive.
Birds – breeding season	Surveys of potential imperial eagle territories (informed after consultation with Doga) to confirm occupation within 1km of the Project[7]. VP surveys around confirmed imperial eagle territories repeating methods deployed during June 2020 surveys.	Monthly surveys, March to July 2021 inclusive.
Pre-works surveys	Walkover across new works areas immediately in advance of vegetation clearance work. Fauna removed/relocated locally, as encountered with a particular focus on sensitive biodiversity such as	Programmed to be undertaken in advance of vegetation clearance work.

[6] Timing specifics should be informed through consultation with in-country specialists

[7] Avoid duplication here if Doga are continuing their monitoring of all imperial eagle territories.

Survey	Outline Methods	Timing[6]
	reptiles and marbled polecat. Exclusion zones established as required (at discretion of ECoW).	

Table B-2 - Indicative monitoring requirements

Survey	Outline Methods	Frequency
Rare plants	Botanical surveys at translocation receptor sites	Post-translocation surveys in years 1, 2, 3, 5, 7, 10. Surveys beyond year 10 to be undertaken as required.
Habitats	Botanical surveys across habitat restoration/replanting areas (as per **HRP**). Provisional G1.A replanting area illustrated within Figure B-1 below.	Post-restoration/replanting surveys in years 1, 2, 3, 5, 7, 10, 15, 20. Surveys beyond year 20 to be undertaken as required.
Fauna	Monitoring of use of animal underpasses (e.g. through deployment of camera traps).	Twice-yearly post operation during spring/summer. To be undertaken in years 1-5 inclusive.
Carcass searching	Walkover surveys at representative locations (including at flight activity hotspots, wooded/scrub habitat around Terkos Basin KBA and other pre-identified areas of increased biodiversity interest) to identify collision mortality carcasses. Searches should be undertaken in the morning and repeated over two consecutive days. Specific timing within the year should coincide with maximum perceived risk for each animal group – e.g. for birds around the Büyükçekmece Lake hotspot, this should be during the winter r migration months.	Post-operation in years, 1, 2, 3, 5, 7, 10.
Bird surveys	VP surveys at the four VPs used during August/September 2020. Monitoring flights around the Project during construction and	During construction (36 hours during each of breeding/non-breeding seasons).

Survey	Outline Methods	Frequency
	operation. 36 hours of survey effort during the non-breeding season. VP surveys around confirmed imperial eagle territory where this overlaps with the Project (e.g. as per VP locations from June 2020), and others following consultation with Doga.	During operation in years 1, 2, 3, 5, 7, 10.
Construction monitoring	Specific monitoring of nest sites during construction, as required. In particular this may be required should any imperial eagle nest sites be identified within 1km of the Project. Monitoring will occur during construction activities while such nest sites are active and will inform adaptive mitigation (e.g. such as temporary cessation of works, etc.). Monitoring of wintering birds at each IBA during construction activities (where it has not been possible to avoid such activities) to monitor bird behaviour and inform adaptive mitigation should significant disturbance impacts be identified (e.g. through temporary cessation of works)	During construction activities between March-July inclusive for nesting birds and October to February inclusive for wintering birds.
IBA monitoring	Ongoing monitoring of conservation management that the Project will contribute towards. To be discussed/agreed with relevant stakeholders (e.g. Doga).	Monitoring to align with/be part of ongoing conservation monitoring at Büyükçekmece Lake and Küçükçekmece Basin.



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Legend

- Indicative Replanting Locations
- Proposed Railway Route



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure B-1 - Indicative Replanting Locations

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Drawing Number: Figure B-1

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Appendix C

CONSTRUCTION PROGRAMME CONSTRAINTS

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Table C-1 – Constructions constraints summary

Biodiversity constraint	Programme consideration
Nesting birds	Construction activities that require the clearance of scrub/woodland vegetation to be timed to avoid March-July (inclusive) where possible. In particular this should apply to scrub/woodland habitat around the Terkos Basin KBA (chainages 52+000 to 69+000) but activities should also be informed by additional survey effort during 2021. Where this is not possible, required vegetation clearance should take place pre-emptively (i.e. significantly prior the planned construction activities) within the preceding non-breeding season so as to remove nesting bird features in advance of their use (remaining cognisant of other sensitivities associated with vegetation clearance such as bat roosts).
Wintering birds	Where possible construction activities around Büyükçekmece Lake (specifically between chainages 25+000 and 28+000) should be timed to avoid wintering months when IBA are present (October to February inclusive). Where this not possible, monitoring of disturbance impacts should take place during construction, with works ceasing in the case of significant disturbance being observed.

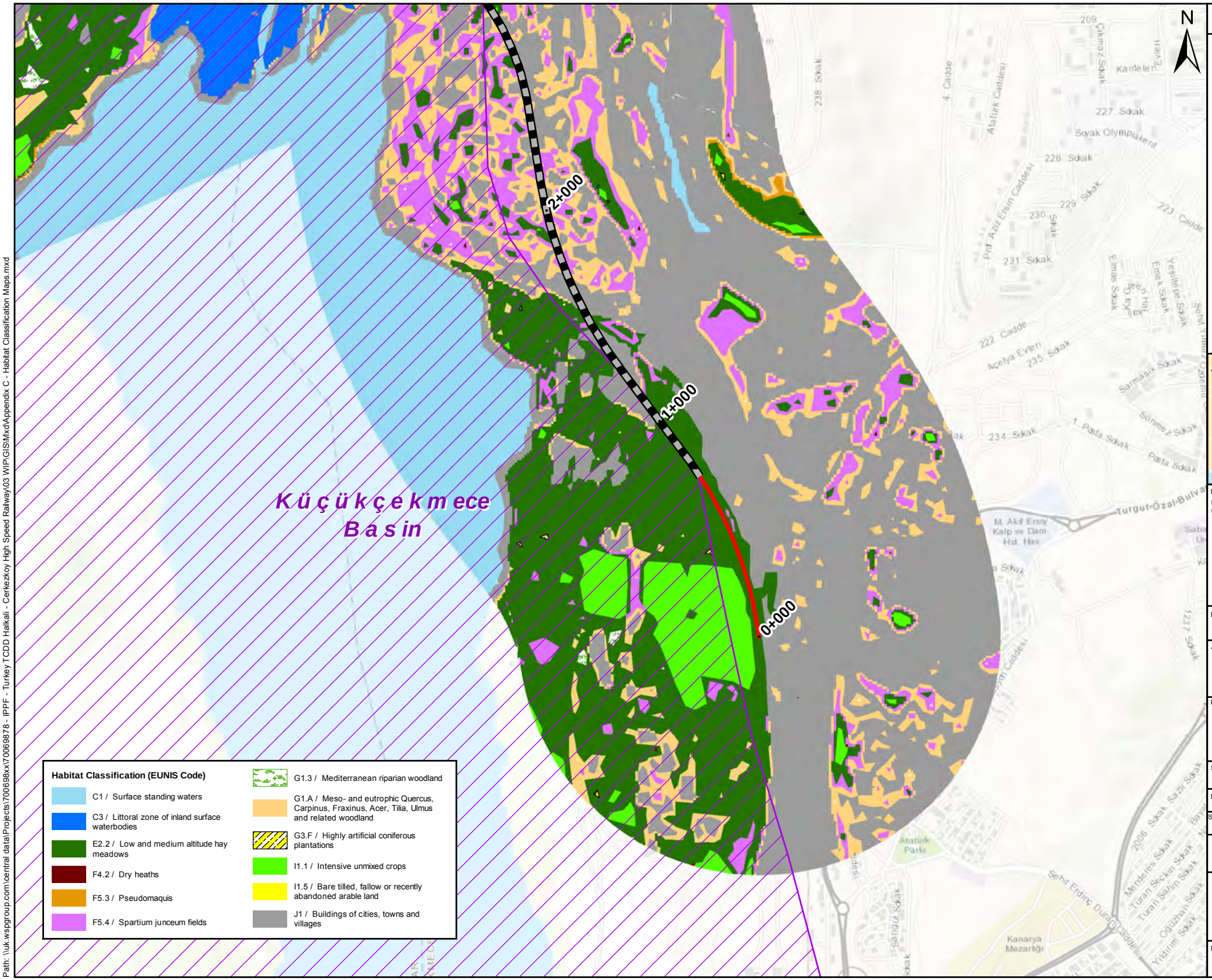
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Appendix N

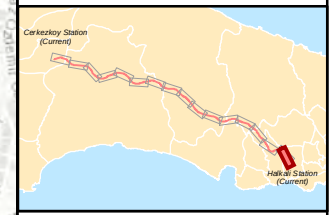
HABITAT CLASSIFICATION MAPS (CHAPTER 8: ECOLOGY



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Legend

- Proposed Railway Route
- Tunnel (TBM - Double Tube)
- Important Bird and Biodiversity Areas (IBAs)



Note:
Habitat Classification based on Sentinel-2A satellite imagery (taken on the 07/04/2020).

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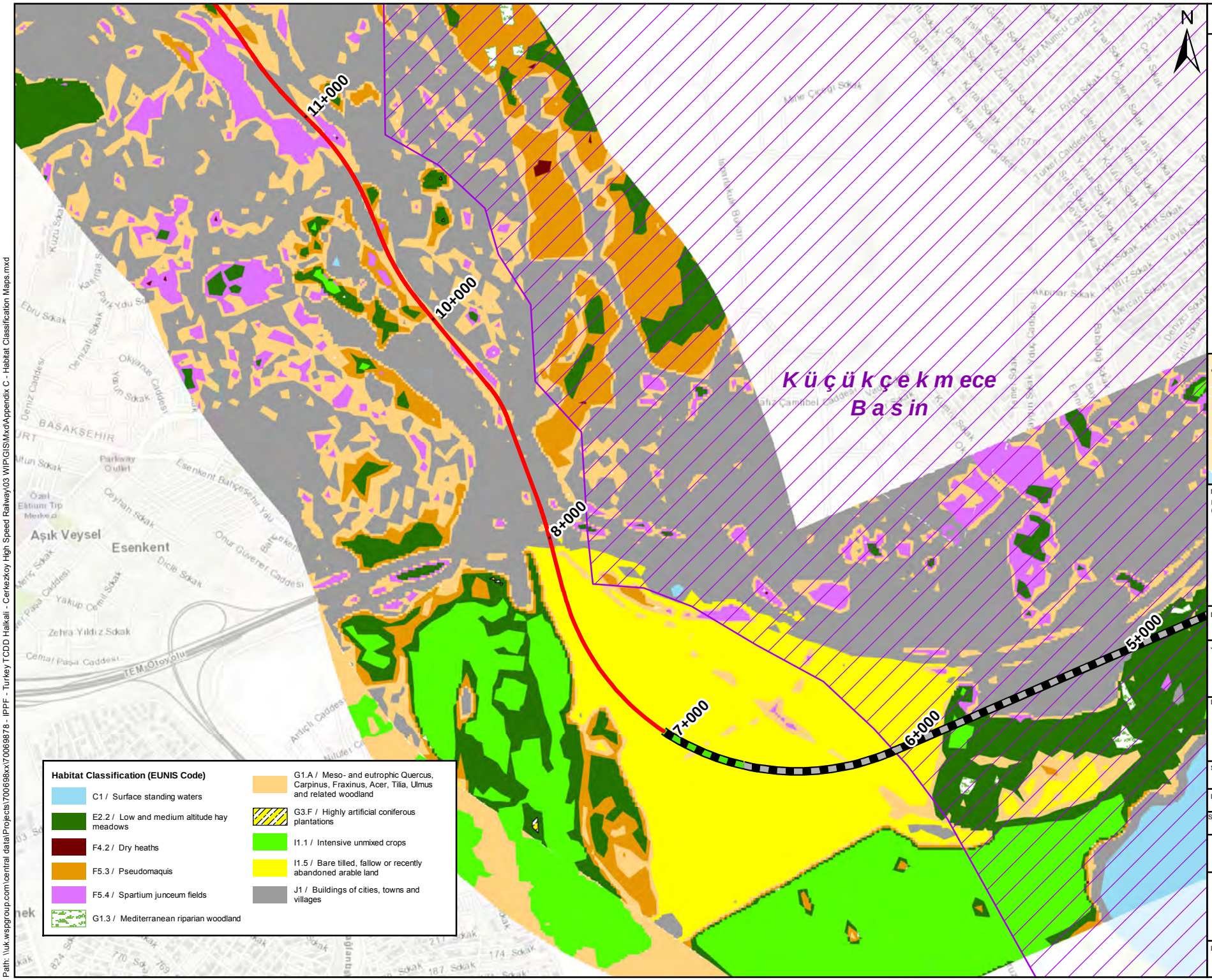
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Tunnel (TBM - Double Tube)
- Tunnel (Cut - Cover)
- Important Bird and Biodiversity Areas (IBAs)



Note:
Habitat Classification based on Sentinel-2A satellite imagery (taken on the 07/04/2020).

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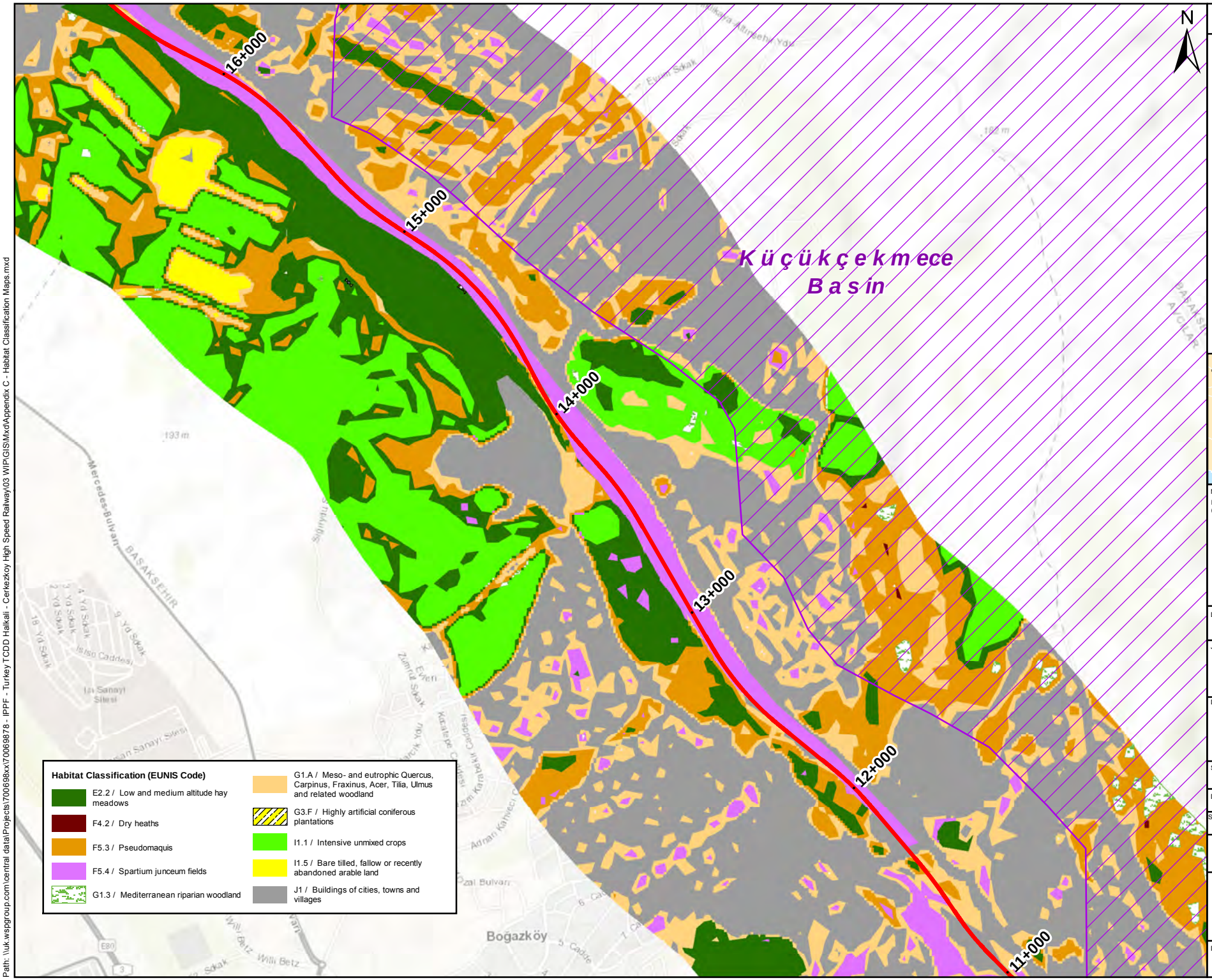
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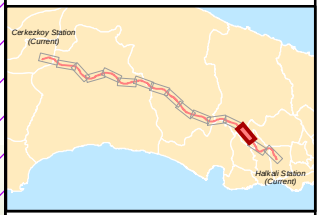
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Legend

- Proposed Railway Route
- Important Bird and Biodiversity Areas (IBAs)



Note:
Habitat Classification based on Sentinel-2A satellite imagery (taken on the 07/04/2020).

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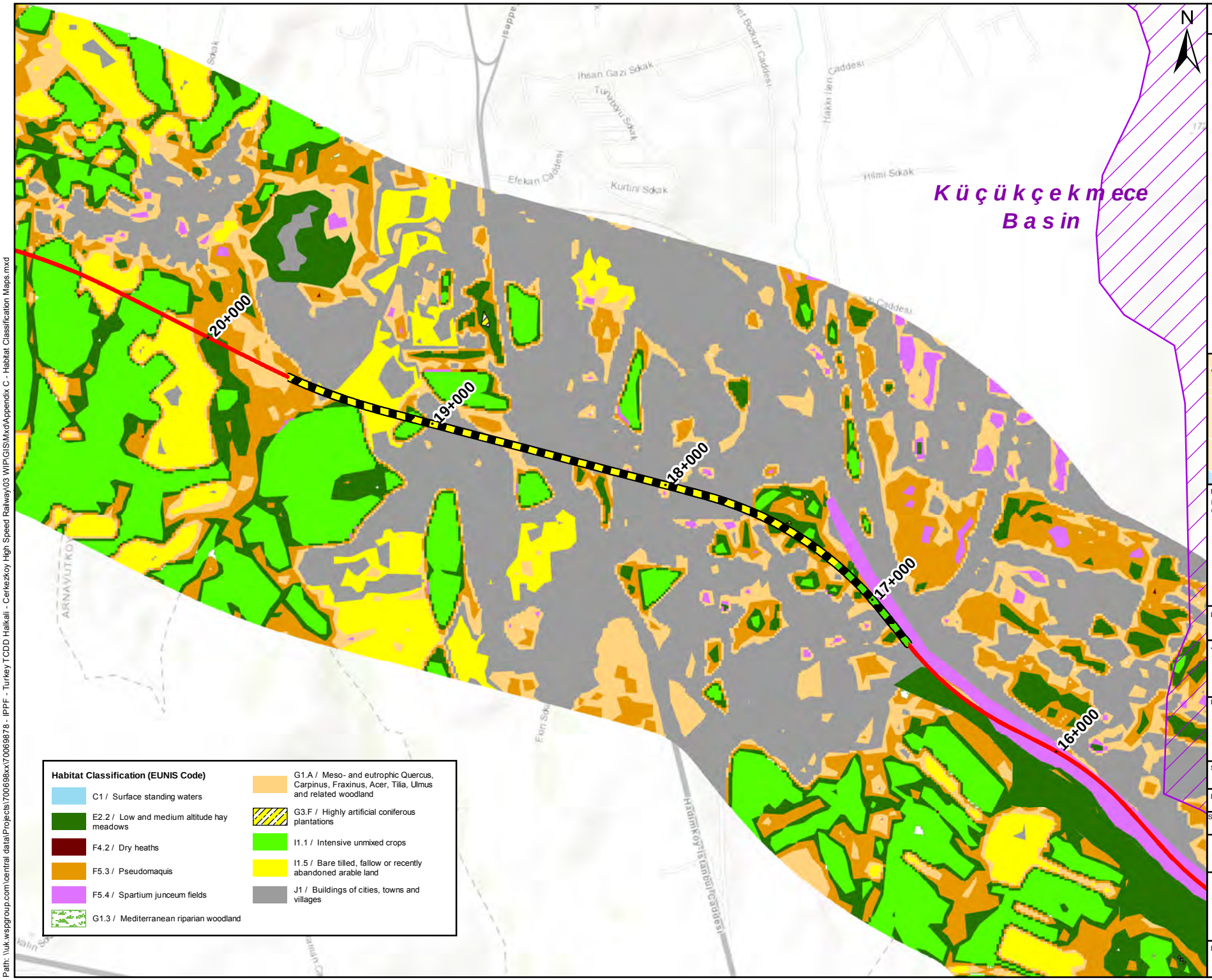
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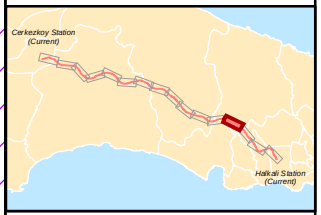
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Tunnel (NATM)
- Tunnel (Cut - Cover)
- Important Bird and Biodiversity Areas (IBAs)



Note:
Habitat Classification based on Sentinel-2A satellite imagery (taken on the 07/04/2020).

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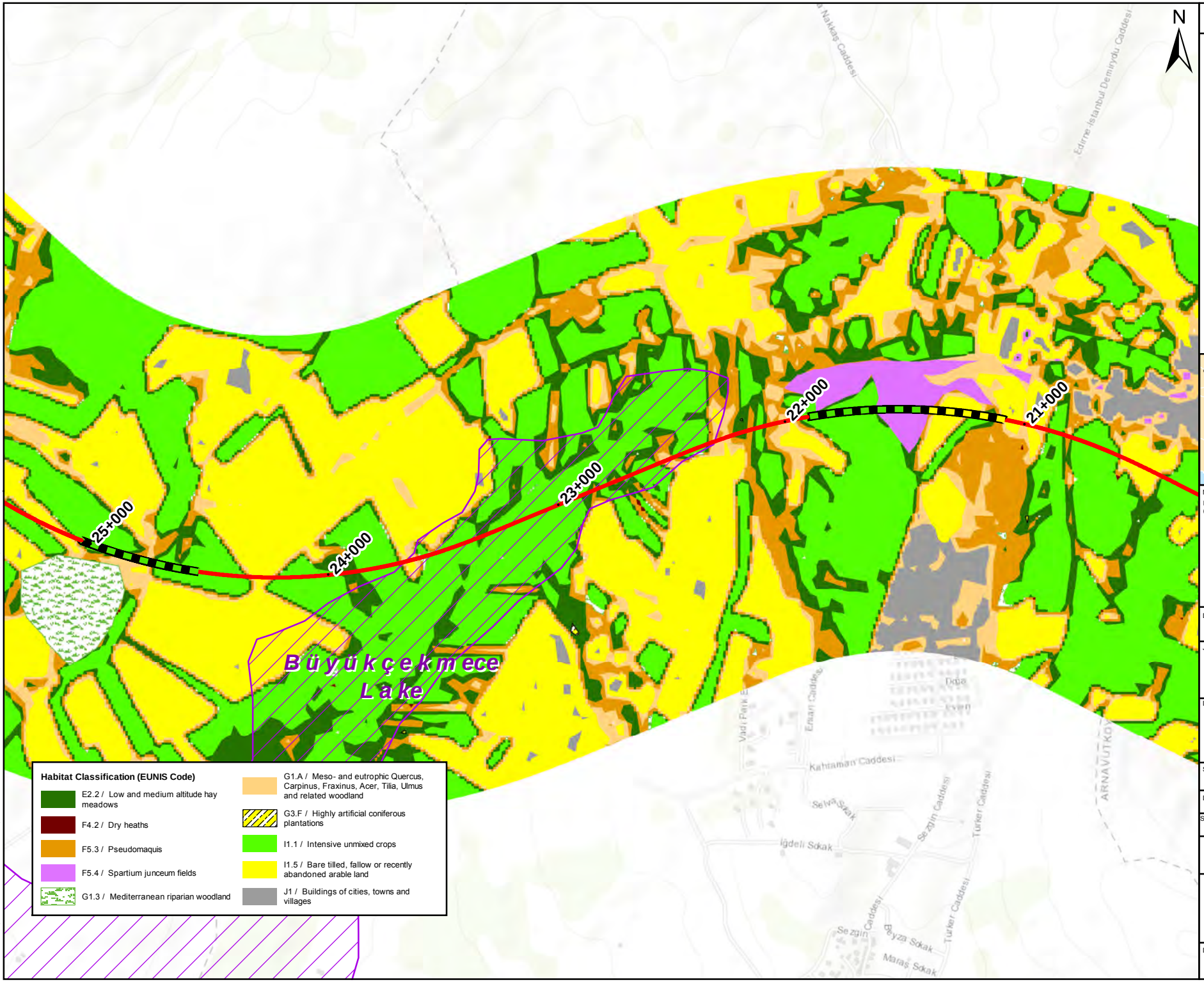
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Legend

- Proposed Railway Route
- Tunnel (NATM)
- Tunnel (Cut - Cover)
- Important Bird and Biodiversity Areas (IBAs)



Note:
Habitat Classification based on Sentinel-2A satellite imagery (taken on the 07/04/2020).

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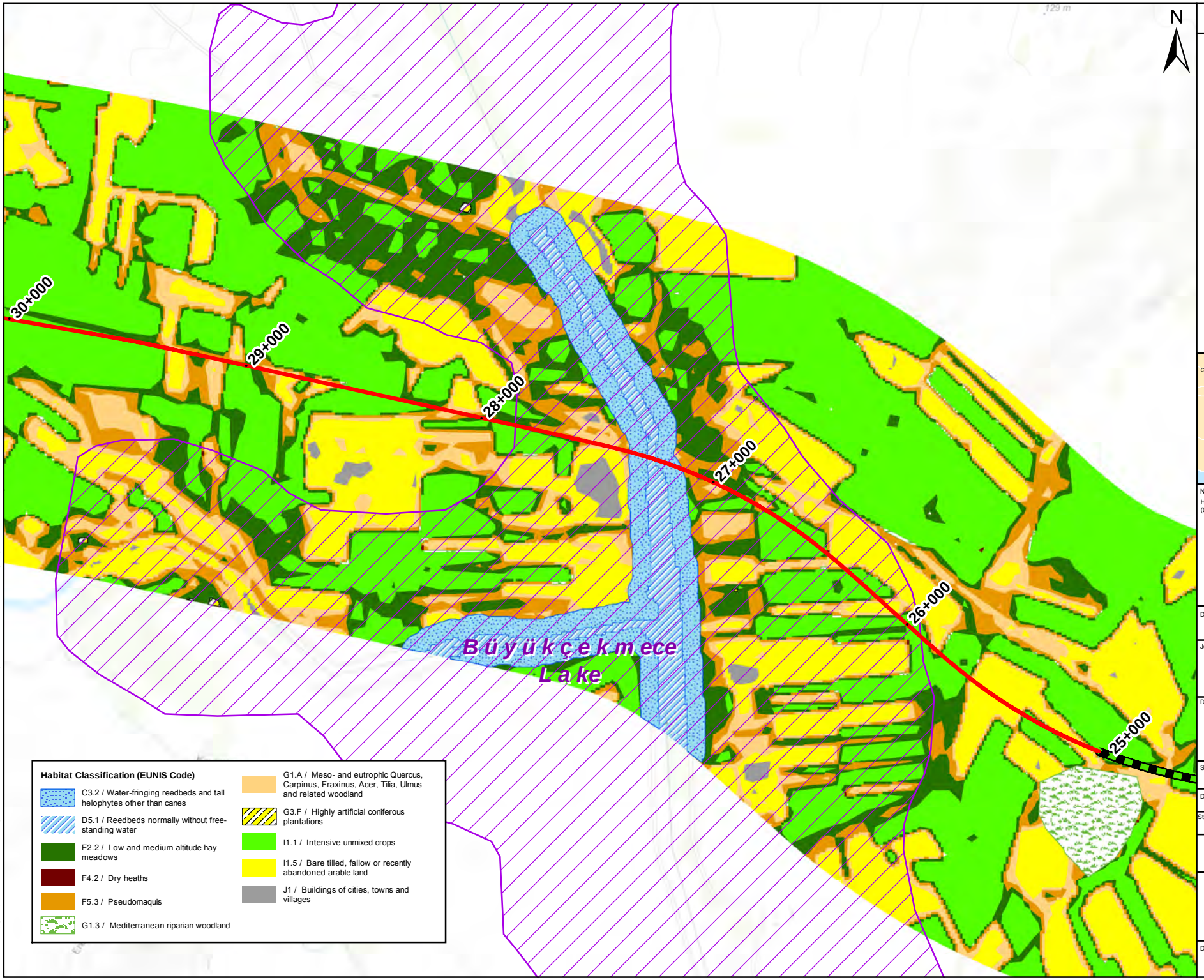
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Legend

- Proposed Railway Route
- Tunnel (Cut - Cover)
- Important Bird and Biodiversity Areas (IBAs)



Note:
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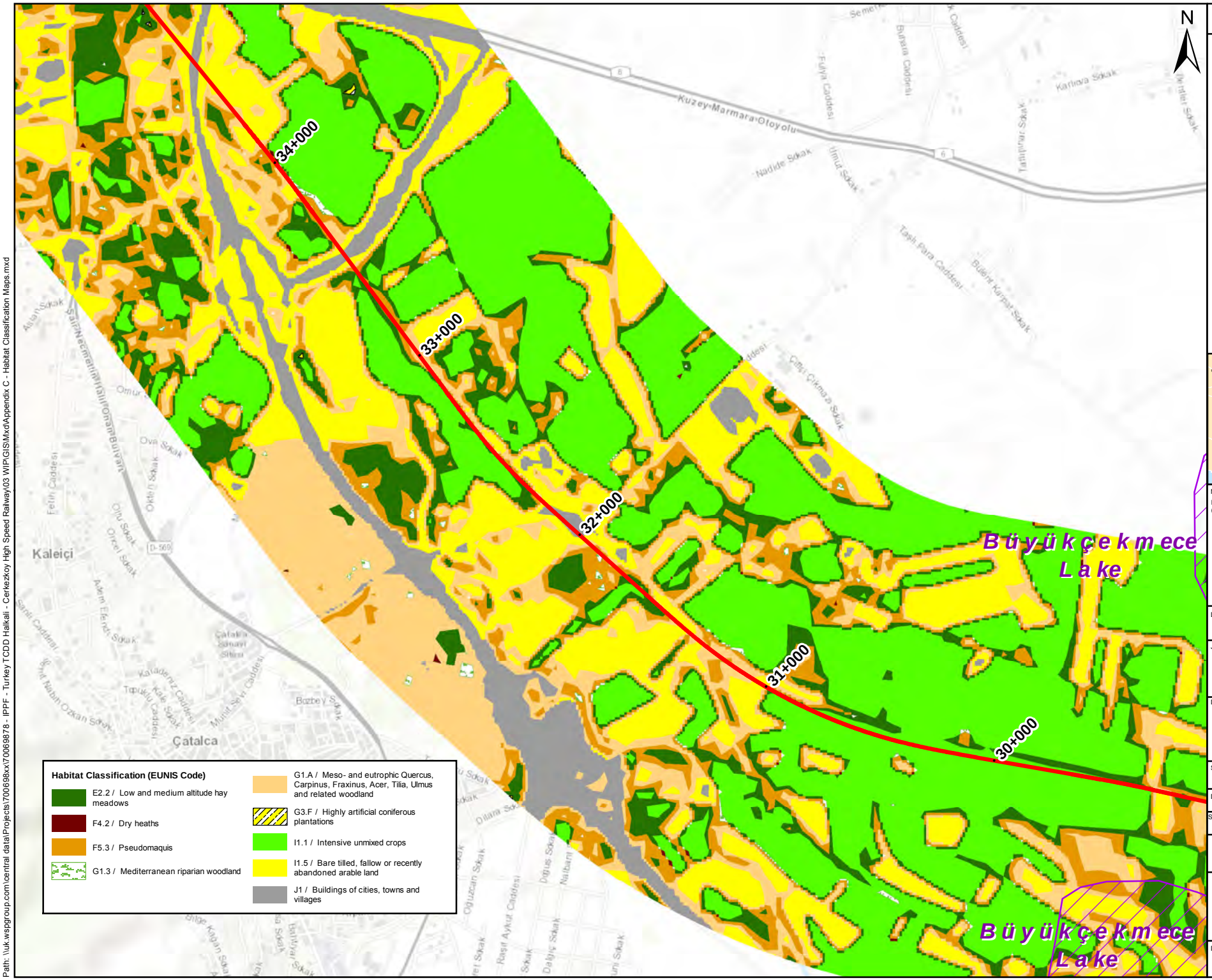
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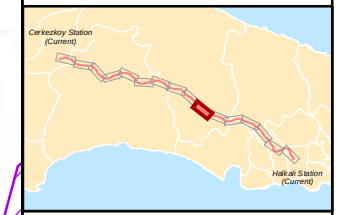
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Legend

- Proposed Railway Route
- Important Bird and Biodiversity Areas (IBAs)



Note:
Habitat Classification based on Sentinel-2A satellite imagery (taken on the 07/04/2020).

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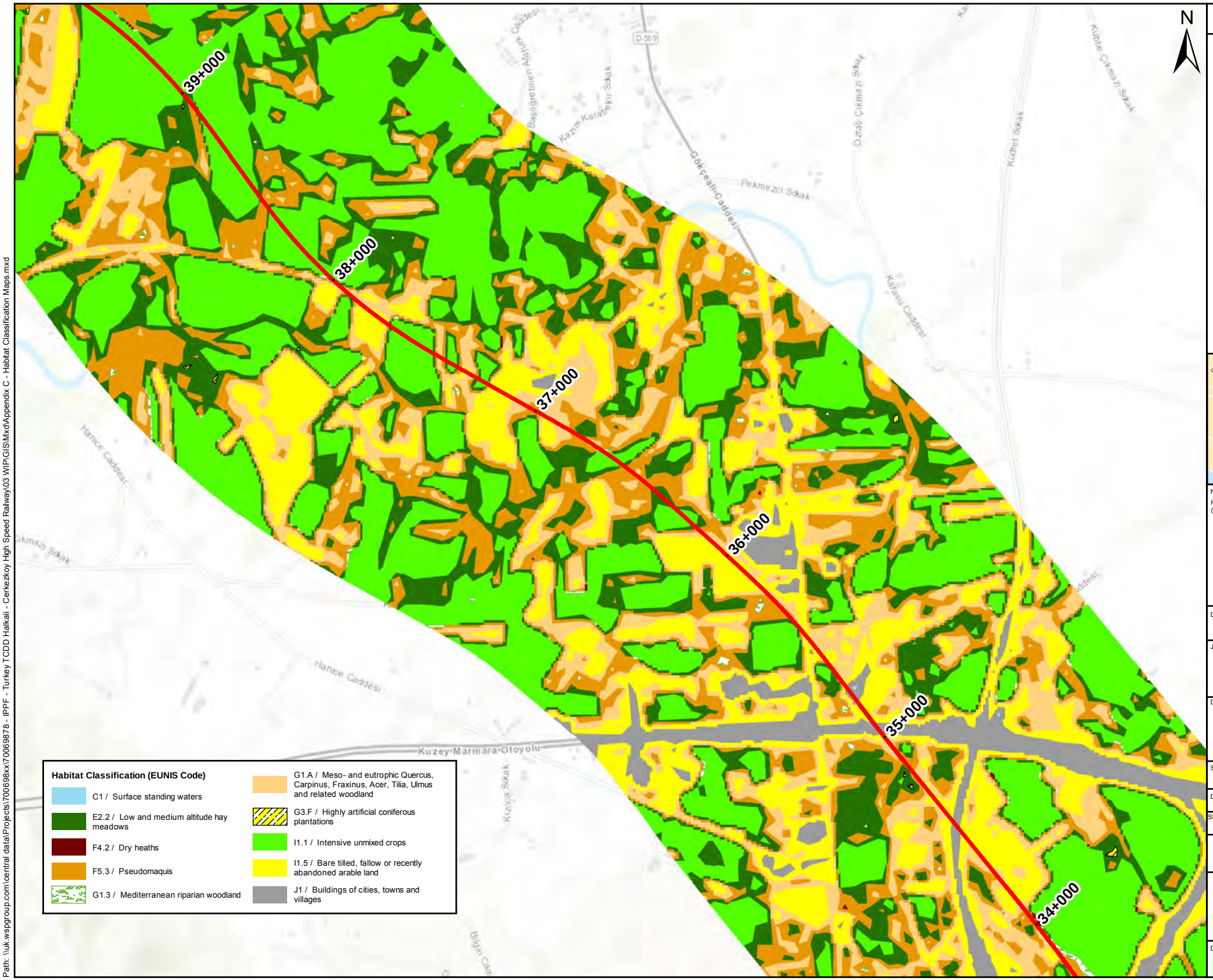
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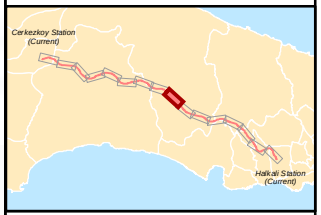
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Legend

Proposed Railway Route



Note:
Habitat Classification based on Sentinel-2A satellite imagery (taken on the 07/04/2020).

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HALKALI – CERKEZKOY HIGH SPEED RAILWAY

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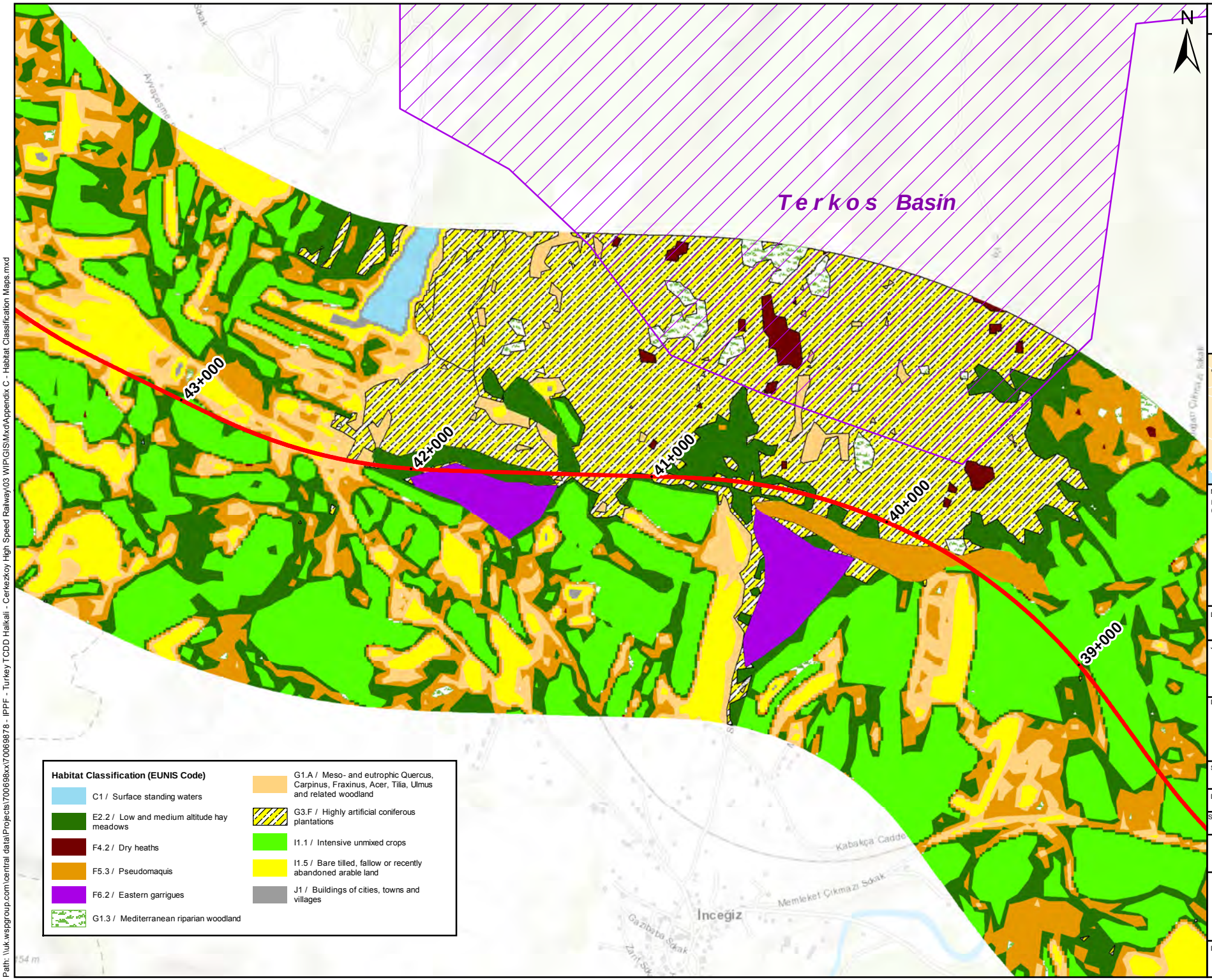
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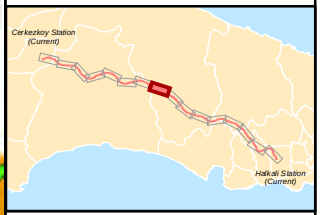
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway
- Important Bird and Biodiversity Areas (IBAs)



Note:
Habitat Classification based on Sentinel-2A satellite imagery (taken on the 07/04/2020).

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HALKALI – CERKEZKOY HIGH SPEED RAILWAY

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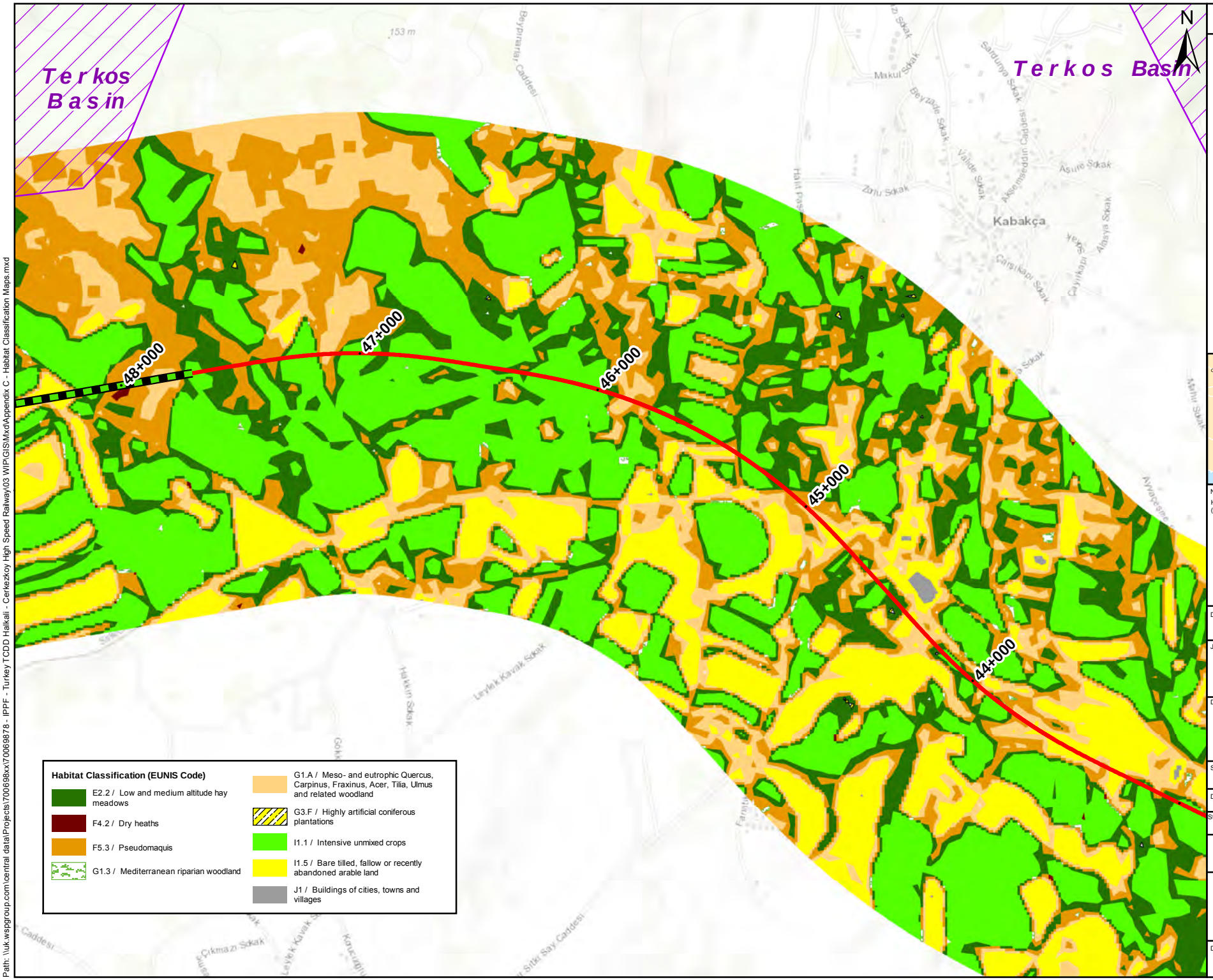
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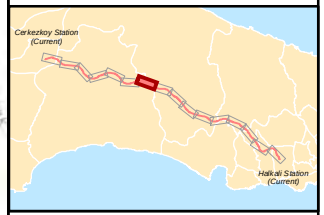
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Tunnel (Cut - Cover)
- Important Bird and Biodiversity Areas (IBAs)



Note:
Habitat Classification based on Sentinel-2A satellite imagery (taken on the 07/04/2020).

Drawing Status
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HALKALI – CERKEZKOY HIGH SPEED RAILWAY

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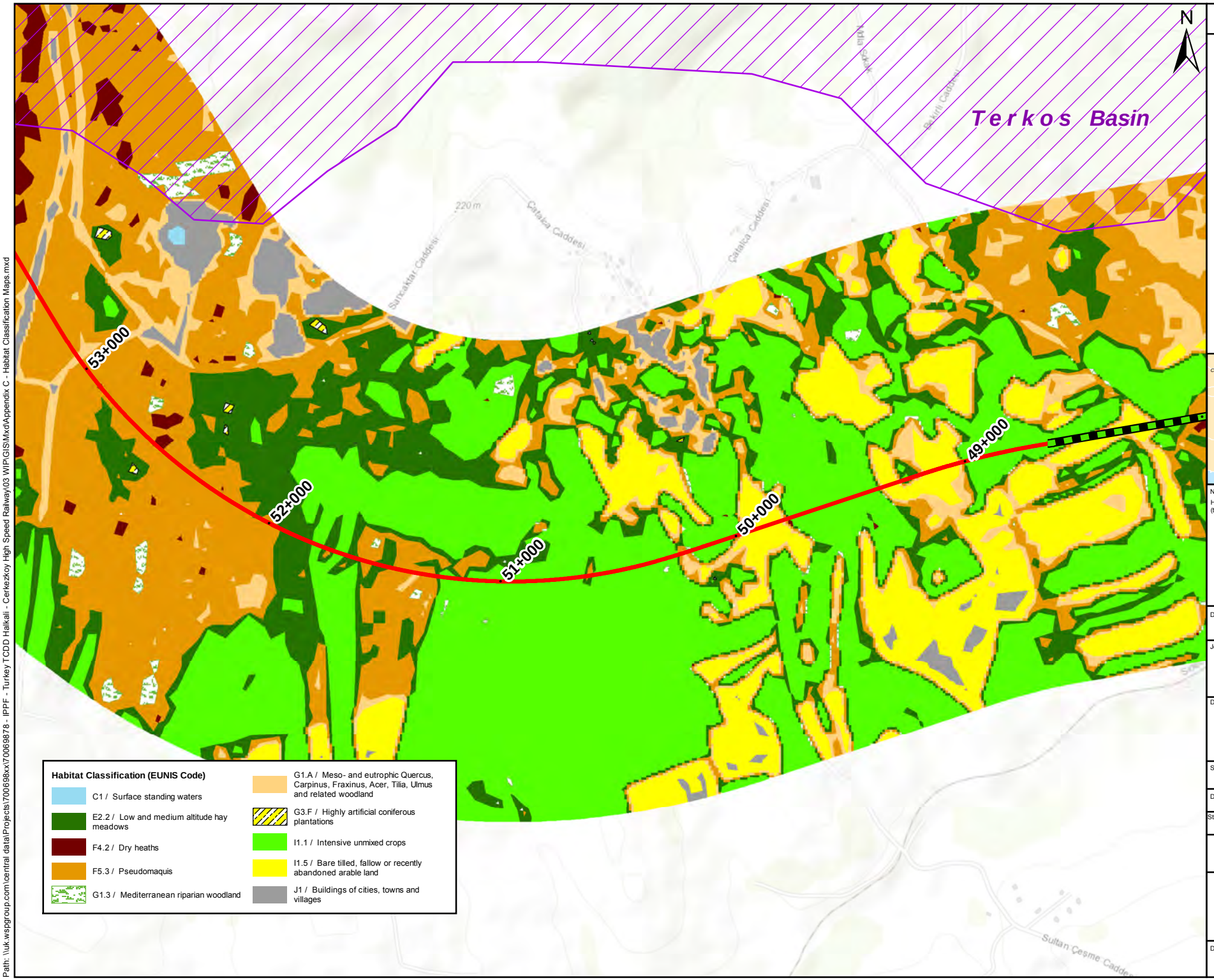
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Legend

- Proposed Railway Route
- Tunnel (Cut - Cover)
- Important Bird and Biodiversity Areas (IBAs)



Note:
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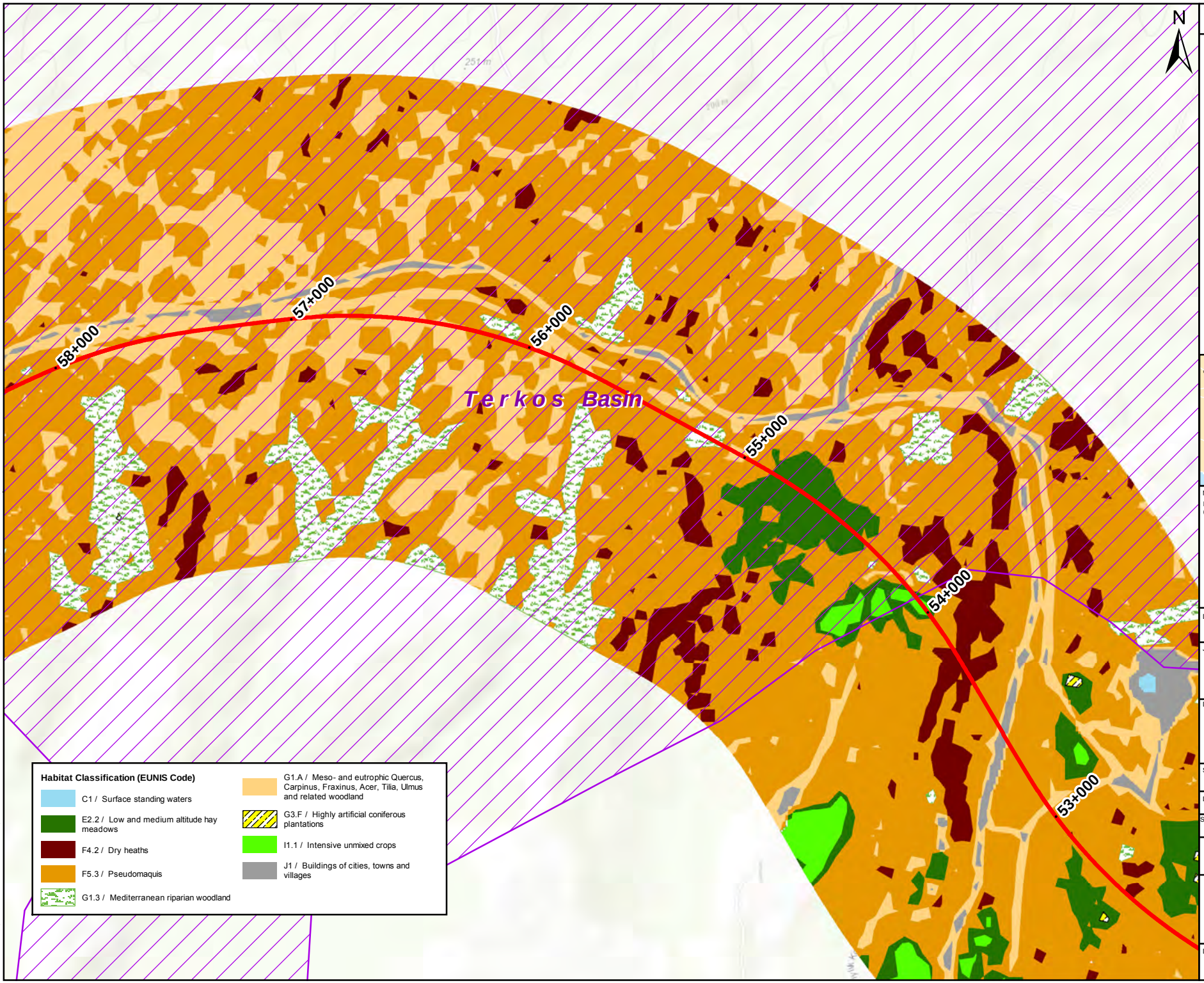
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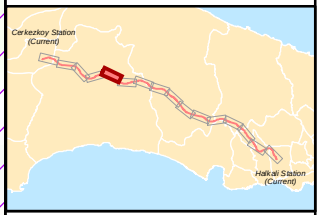
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Legend

- Proposed Railway Route
- Important Bird and Biodiversity Areas (IBAs)



Note:
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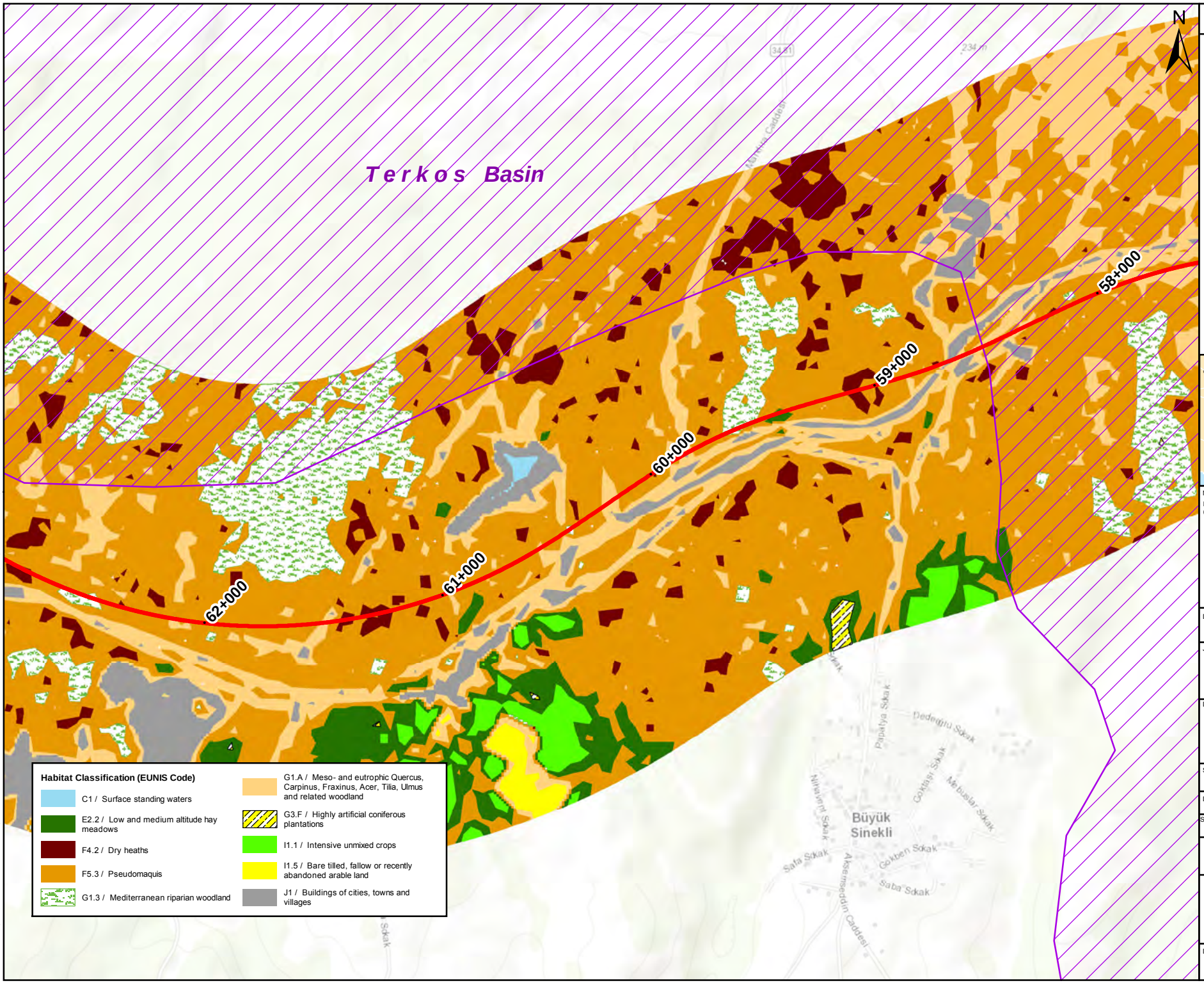
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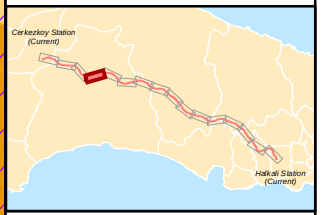
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Important Bird and Biodiversity Areas (IBAs)



Note:
Habitat Classification based on Sentinel-2A satellite imagery (taken on the 07/04/2020).

Drawing Status
FINAL

Job Title:
HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title
Habitat Classification

Scale at A4
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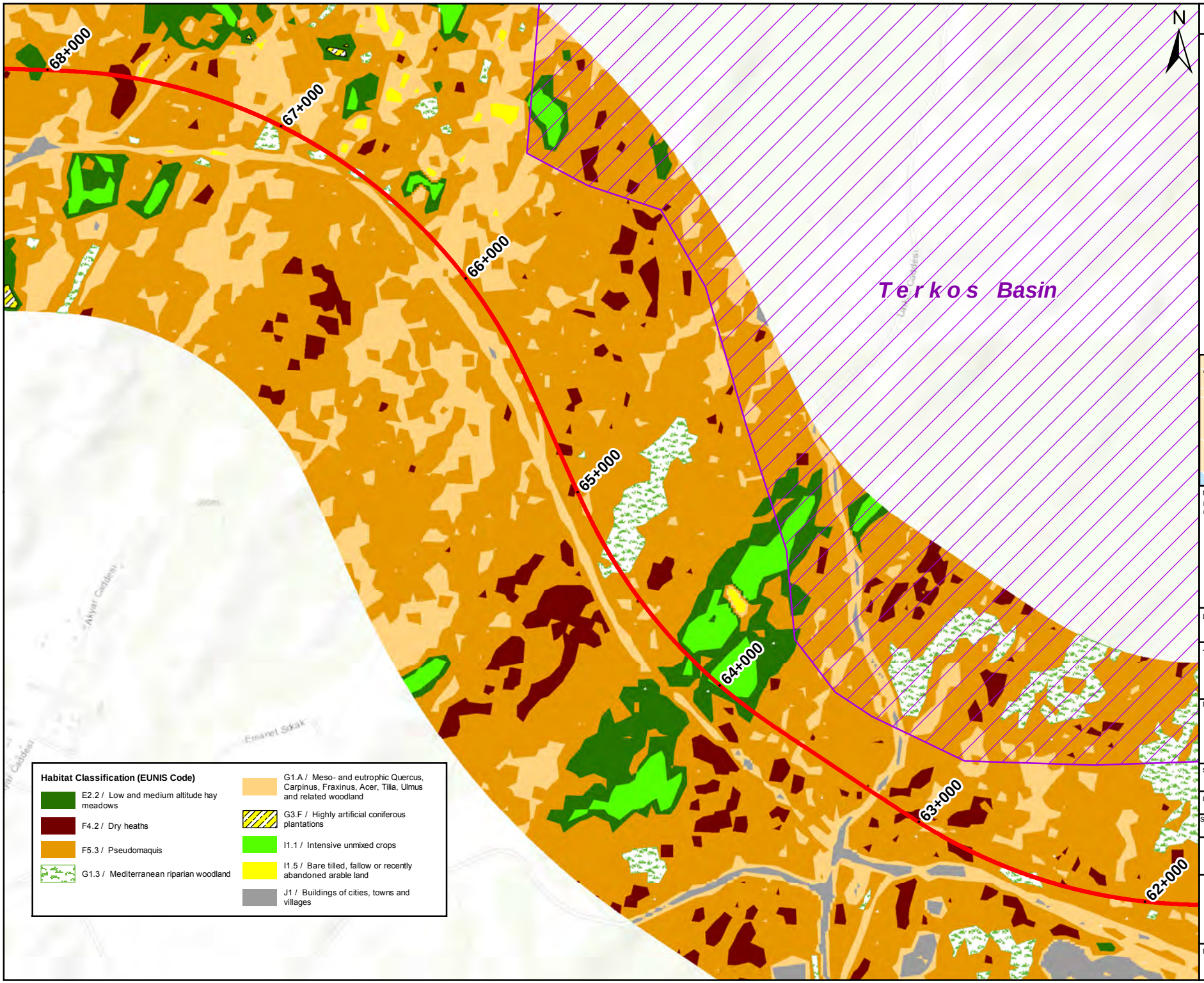
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Drawing Number
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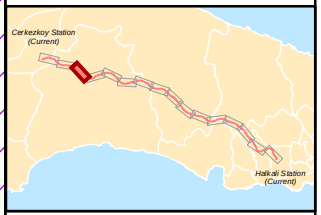
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Important Bird and Biodiversity Areas (IBAs)



Note:
Habitat Classification based on Sentinel-2A satellite imagery (taken on the 07/04/2020).

Drawing Status
FINAL

Job Title:
HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title
Habitat Classification

Scale at A4
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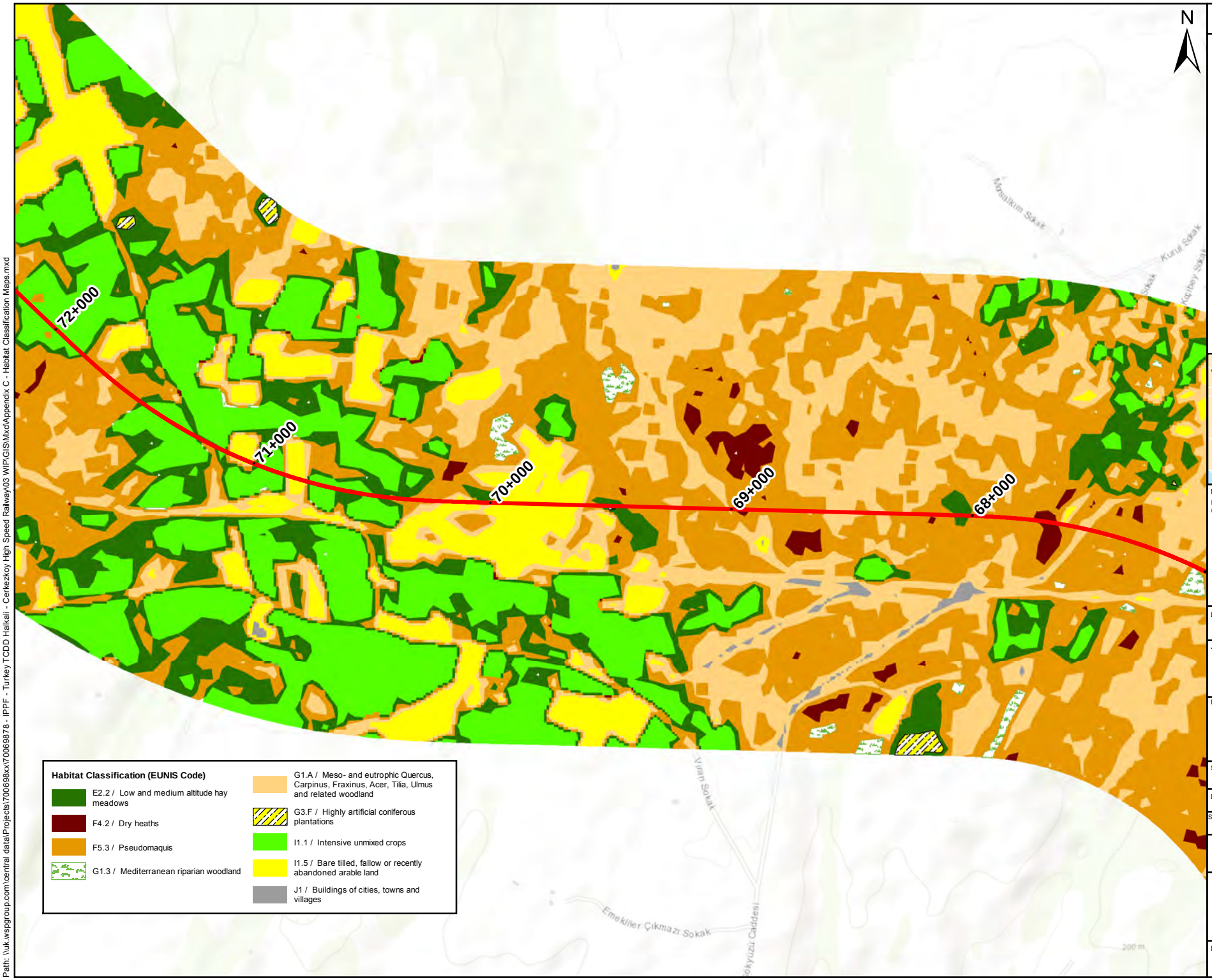
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Drawing Number
(14 / 17)

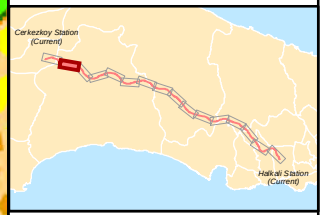
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

Proposed Railway Route



Note:

Habitat Classification based on Sentinel-2A satellite imagery (taken on the 07/04/2020).

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Habitat Classification

Scale at A4

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Stage 1 check	Stage 2 check	Originated	Date
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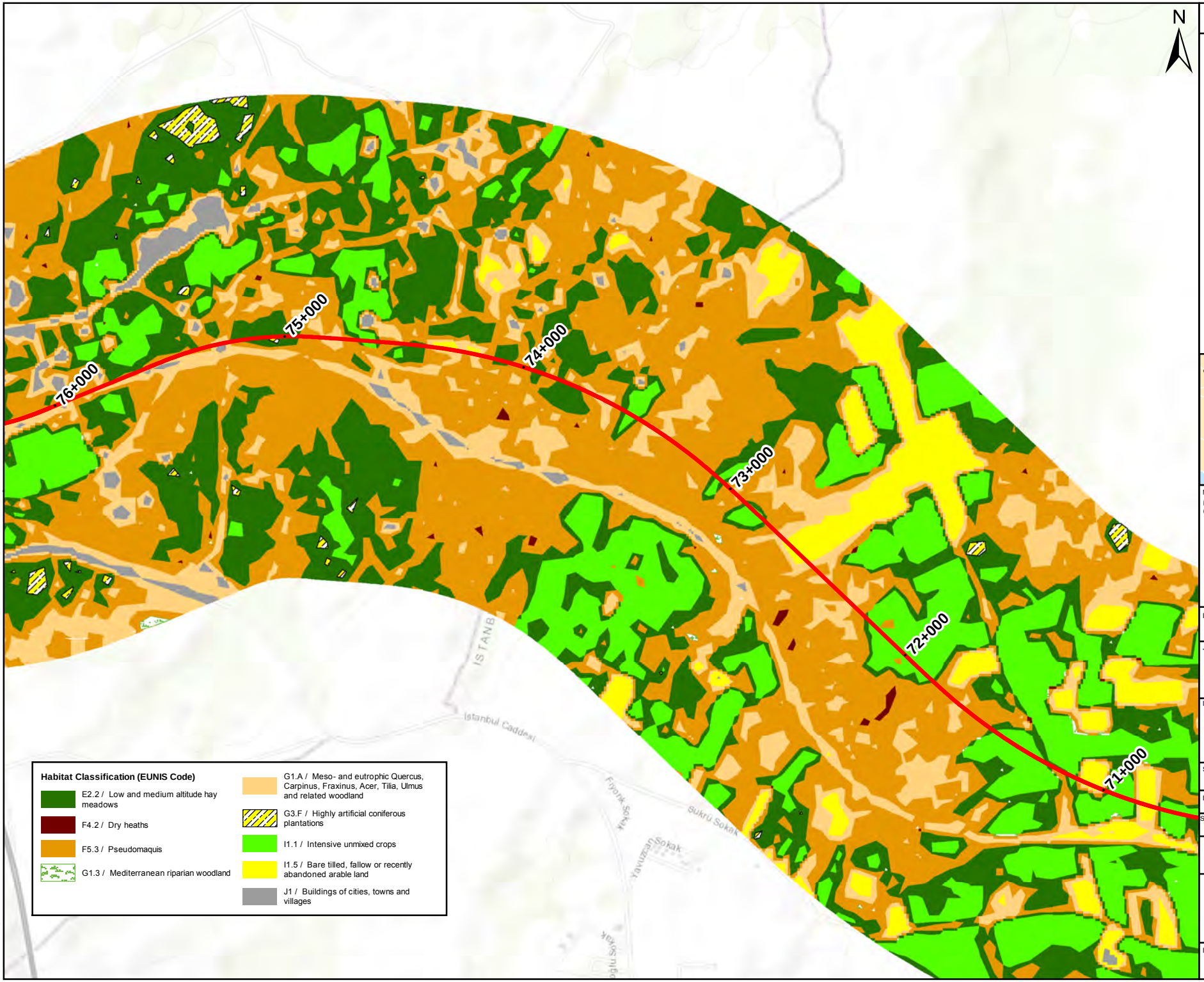
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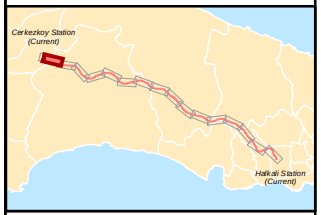
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

Proposed Railway



Note:

Habitat Classification based on Sentinel-2A satellite imagery (taken on the 07/04/2020).

Drawing Status

FINAL

Job Title:

HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title

Habitat Classification

Scale at A4

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JS	JW	DG	05/03/2021

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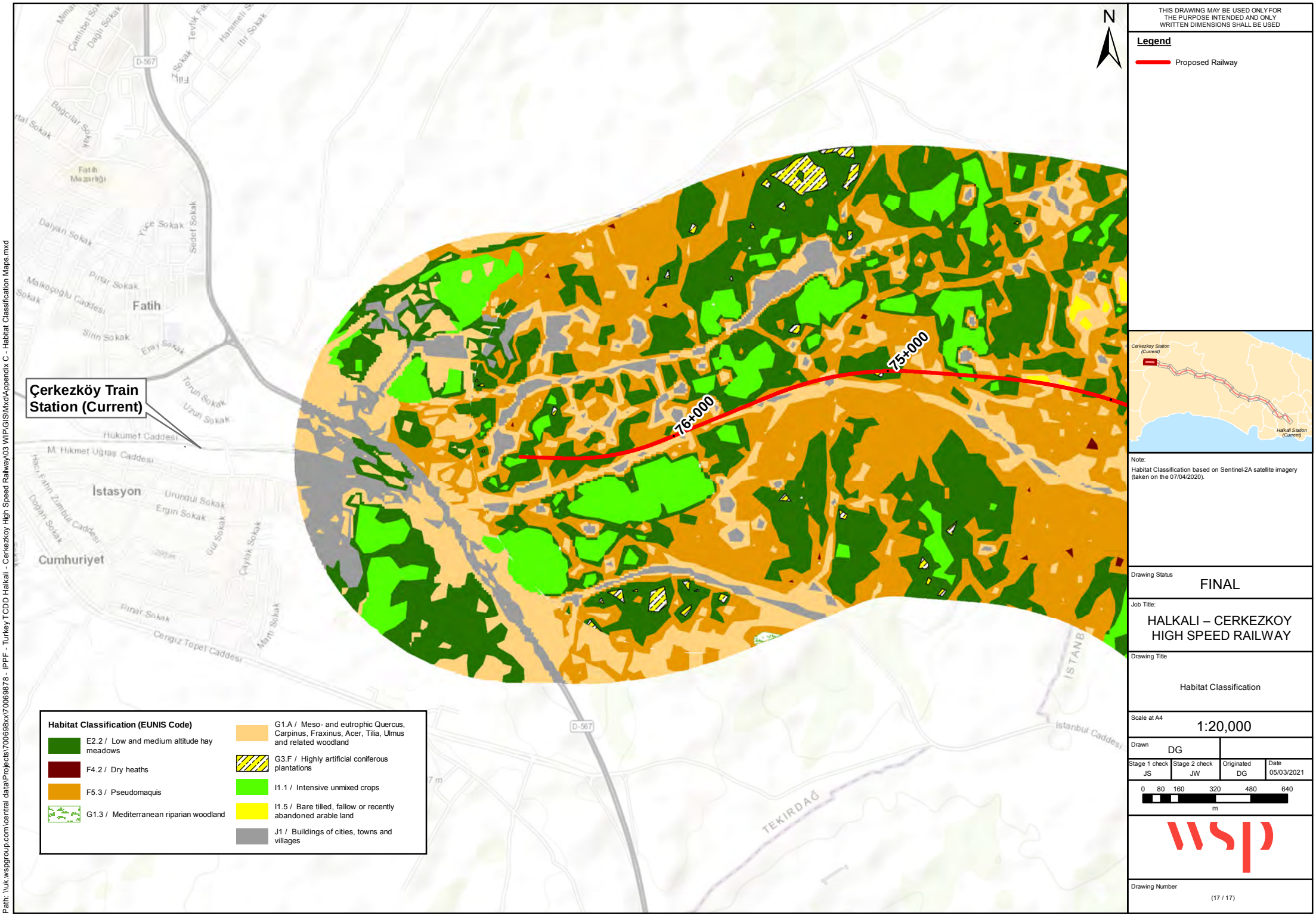
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

Proposed Railway

Note:
Habitat Classification based on Sentinel-2A satellite imagery (taken on the 07/04/2020).

Drawing Status
FINAL

Job Title:
HALKALI – CERKEZKOY HIGH SPEED RAILWAY

Drawing Title
Habitat Classification

Scale at A4
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JS	JW	DG	05/03/2021

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Drawing Number
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Appendix O

CULTURAL HERITAGE ASSET FIGURES (CHAPTER 9: CULTURAL HERITAGE)

Public



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Proposed Railway Route
- Tunnel (TBM - Double Tube)
- Expropiation Corridor
- Survey Areas Identified by the UK Team
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure 9-2 - Cultural Heritage Assets

Scale at A4
1:20,000

Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
PR	JW	DG	25/02/2021

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m

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Drawing Number
Figure 9-2

Path: \\uk.wspgroup.com\central data\Projects\700698xx\700698878 - IPPF - Turkey TCDD Halkali - Cerkezkoy High Speed Railway\03 WIP\GIS\MxdFigures 9-2 to 9-17 - Cultural Heritage Assets.mxd



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Proposed Railway Route
- Tunnel (TBM - Double Tube)
- Tunnel (Cut - Cover)
- Expropiation Corridor
- Survey Areas Identified by the UK Team
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 9-3 - Cultural Heritage Assets

Scale at A4: 1:20,000

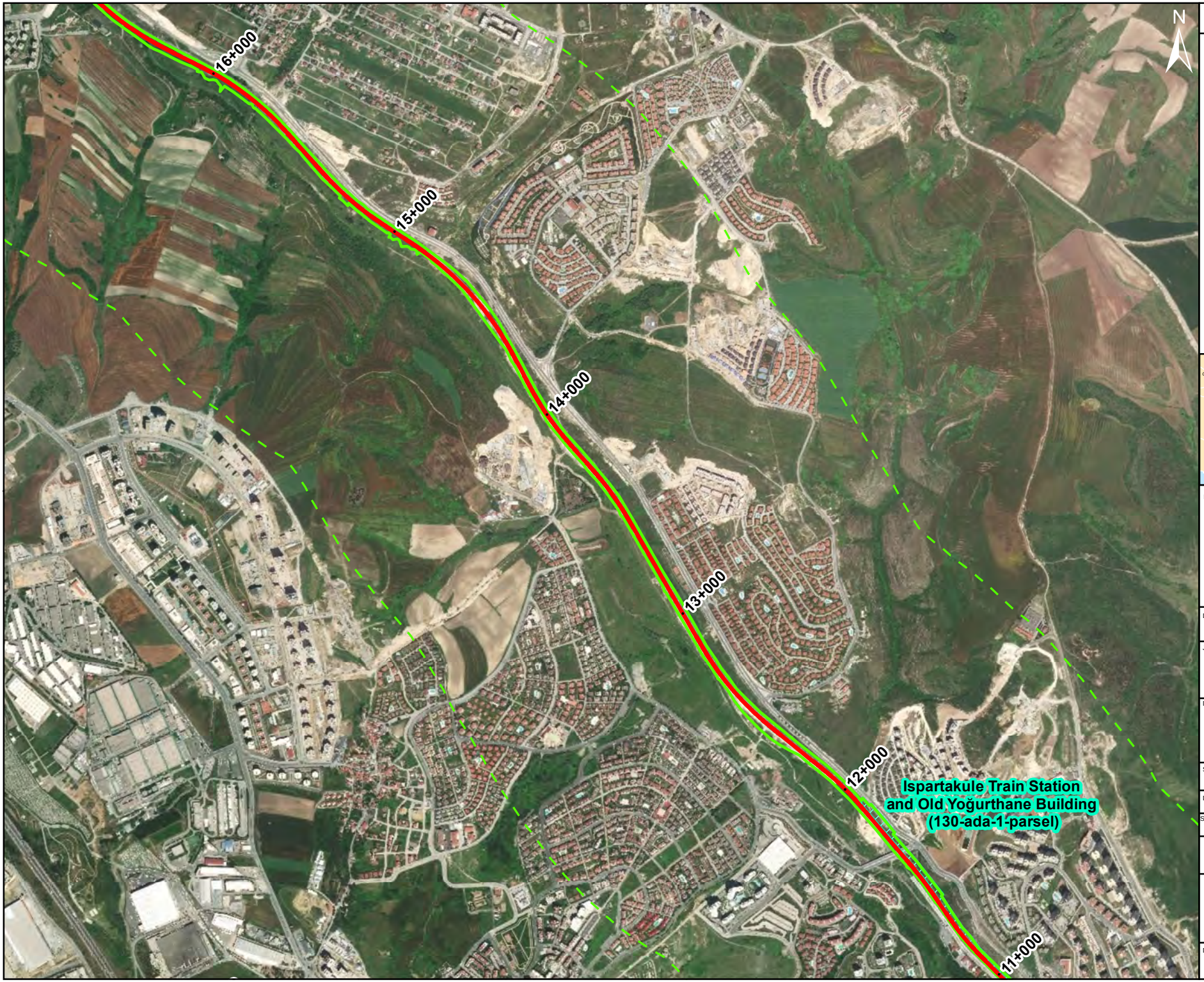
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Drawing Number: Figure 9-3

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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Proposed Railway Route
- Expropiation Corridor
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure 9-4 - Cultural Heritage Assets

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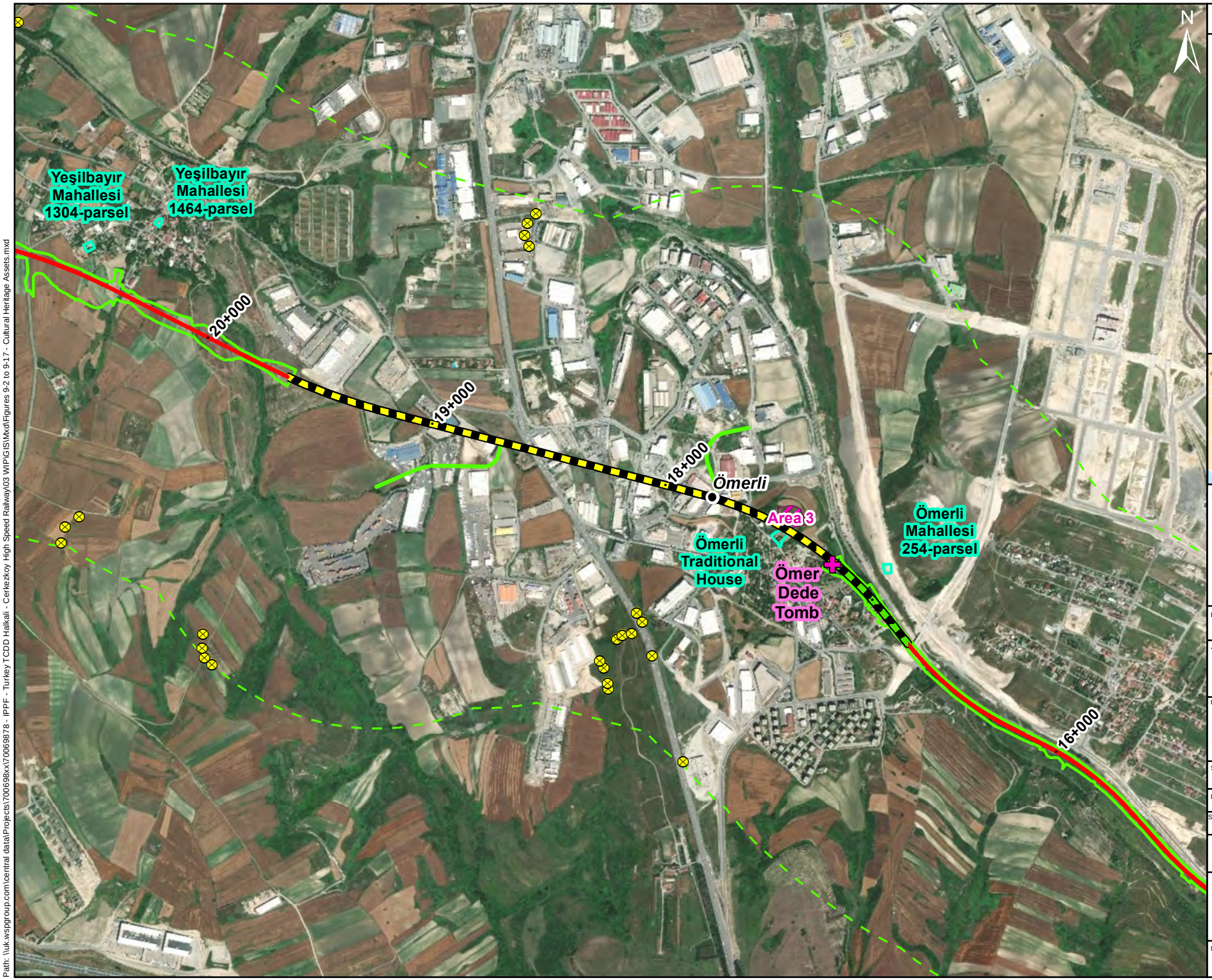
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PR	JW	DG	25/02/2021

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wsp

Drawing Number
Figure 9-4

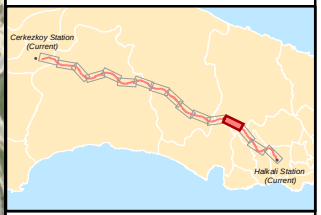
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- 20th Century Military Bunkers and Ditches
- Grave
- Proposed Railway Route
- Tunnel (NATM)
- Tunnel (Cut - Cover)
- Expropiation Corridor
- Survey Areas Identified by the UK Team
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 9-5 - Cultural Heritage Assets

Scale at A4: 1:20,000

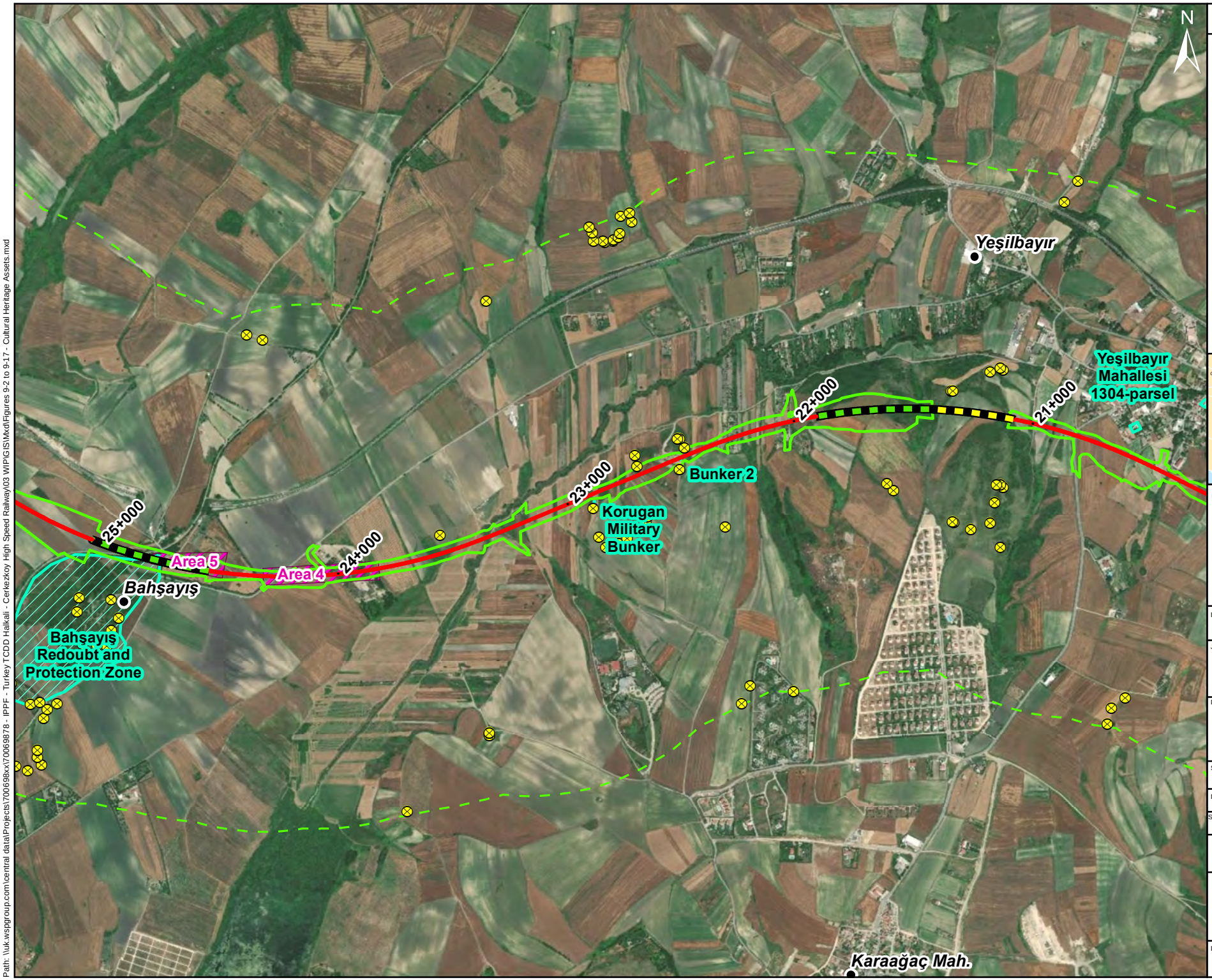
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PR	JW	DG	25/02/2021

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wsp

Drawing Number: Figure 9-5

Path: \\uk.wspgroup.com\central data\Projects\70069878xx\70069878 - IPPF - Turkey TCDD Halkali - Cerkezkoy High Speed Railway\03 WIP\GIS\Mxd\Figures 9-2 to 9-17 - Cultural Heritage Assets.mxd



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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- 20th Century Military Bunkers and Ditches
- Proposed Railway Route
- Tunnel (NATM)
- Tunnel (Cut - Cover)
- Expropiation Corridor
- Survey Areas Identified by the UK Team
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 9-6 - Cultural Heritage Assets

Scale at A4: 1:20,000

Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
PR	JW	DG	25/02/2021

0 75 150 300 450 600
m

wsp

Drawing Number: Figure 9-6



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- 20th Century Military Bunkers and Ditches
- Proposed Railway Route
- Tunnel (Cut - Cover)
- Expropiation Corridor
- Survey Areas Identified by the UK Team
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 9-7 - Cultural Heritage Assets

Scale at A4: 1:20,000

Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
PR	JW	DG	25/02/2021

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m

wsp

Drawing Number: Figure 9-7

Path: \\uk.wspgroup.com\central data\Projects\70069878xx\70069878 - IPPF - Turkey TCDD Halkali - Cerkezkoy High Speed Railway\03 WIP\GIS\MxdFigures 9-2 to 9-17 - Cultural Heritage Assets.mxd



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Proposed Railway Route
- Expropiation Corridor
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 9-8 - Cultural Heritage Assets

Scale at A4: 1:20,000

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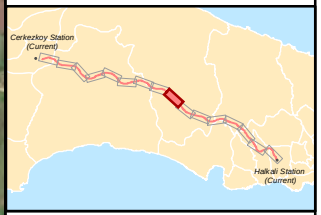
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Expropiation Corridor
- Survey Areas Identified by the UK Team
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure 9-9 - Cultural Heritage Assets

Scale at A4
1:20,000

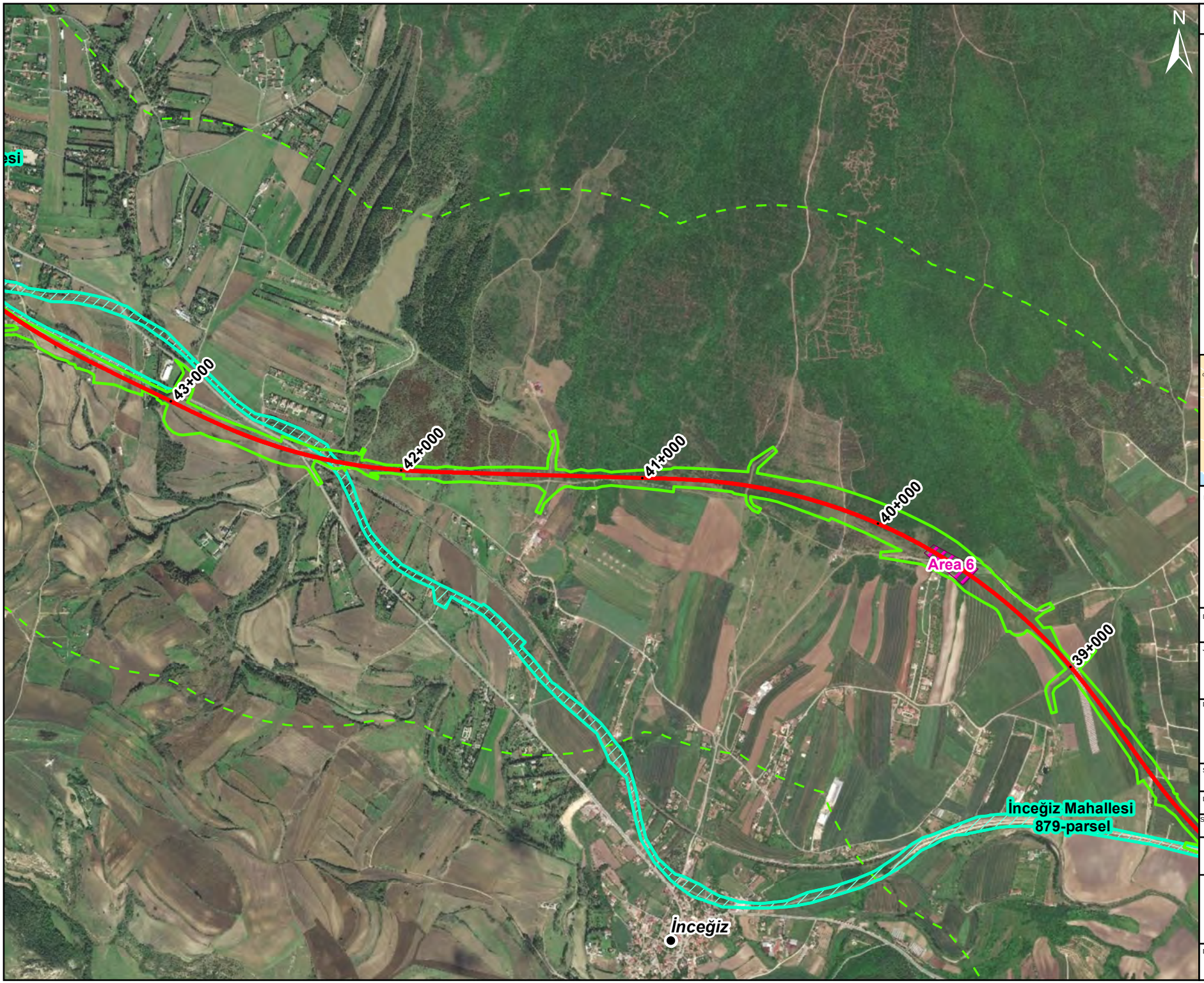
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Drawing Number
Figure 9-9

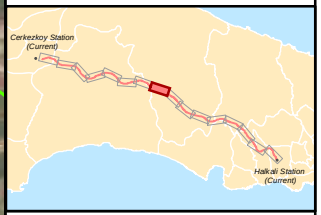
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Proposed Railway Route
- Expropiation Corridor
- Survey Areas Identified by the UK Team
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure 9-10 - Cultural Heritage Assets

Scale at A4
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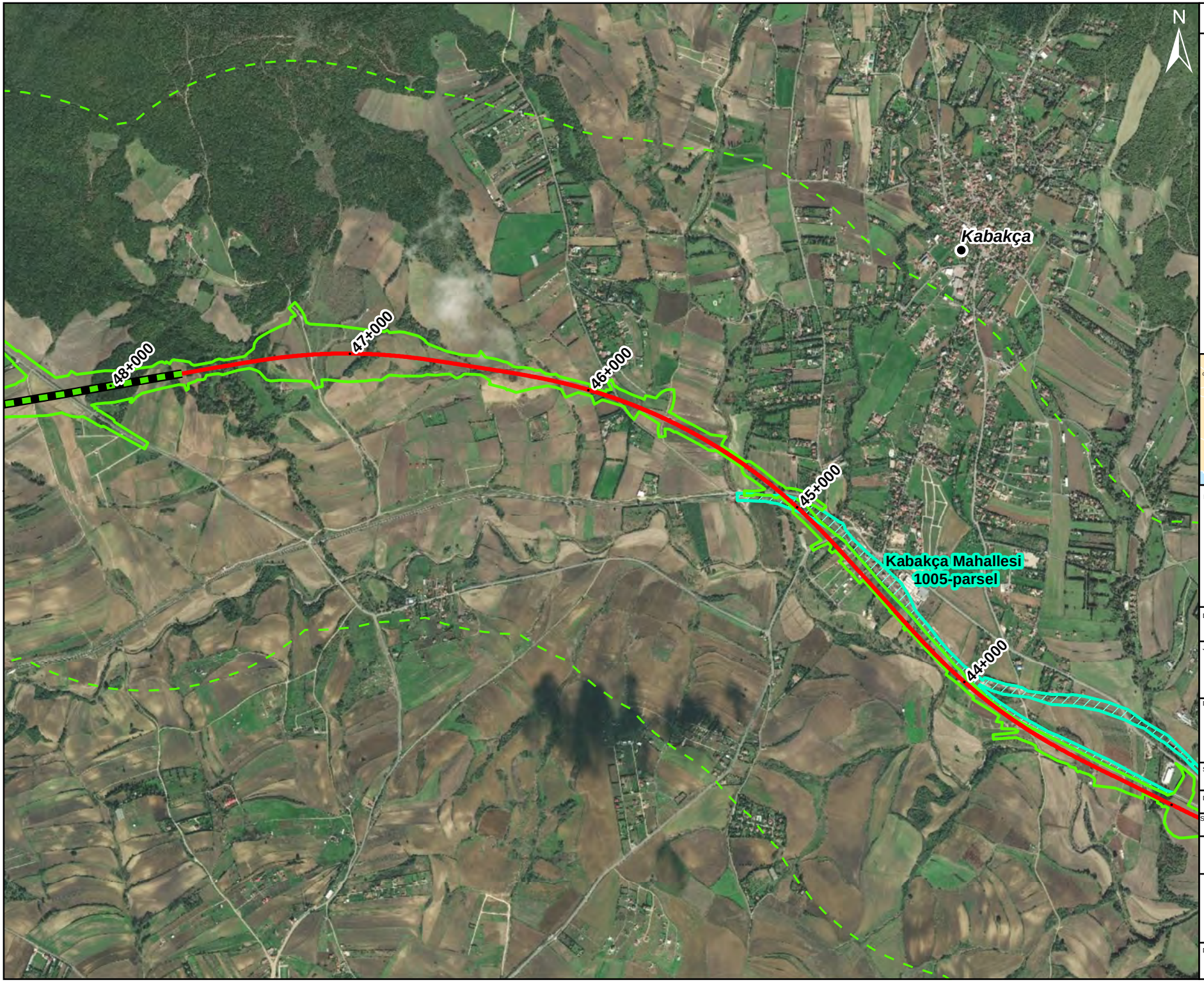
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wsp

Drawing Number
Figure 9-10

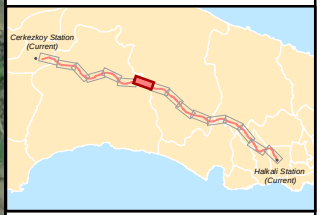
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Proposed Railway Route
- Tunnel (Cut - Cover)
- Expropiation Corridor
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 9-11 - Cultural Heritage Assets

Scale at A4: 1:20,000

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PR	JW	DG	25/02/2021

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Drawing Number: Figure 9-11

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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Proposed Railway Route
- Tunnel (Cut - Cover)
- Expropiation Corridor
- Survey Areas Identified by the UK Team
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 9-12 - Cultural Heritage Assets

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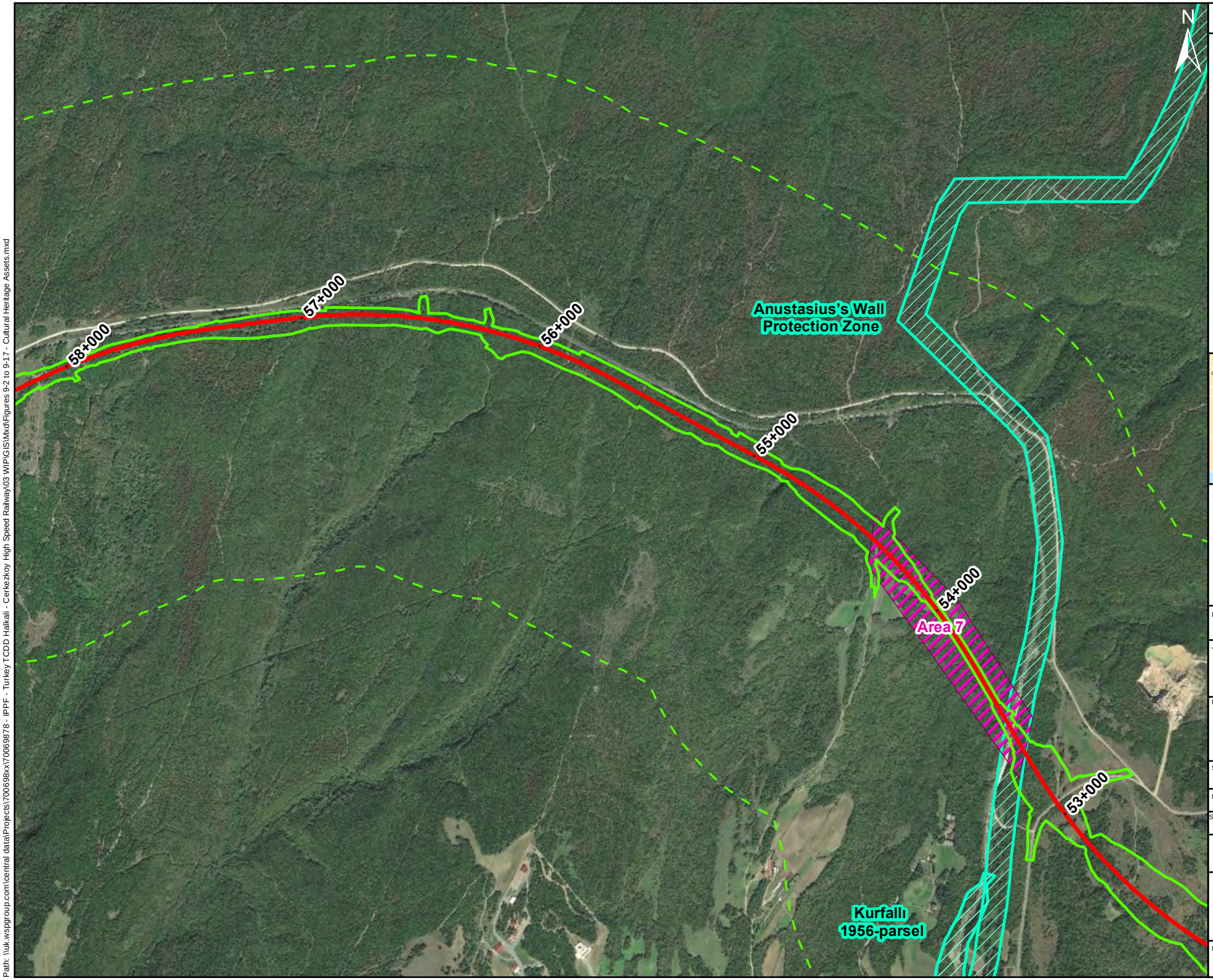
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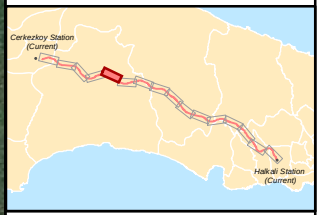
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Expropiation Corridor
- Survey Areas Identified by the UK Team
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure 9-13 - Cultural Heritage Assets

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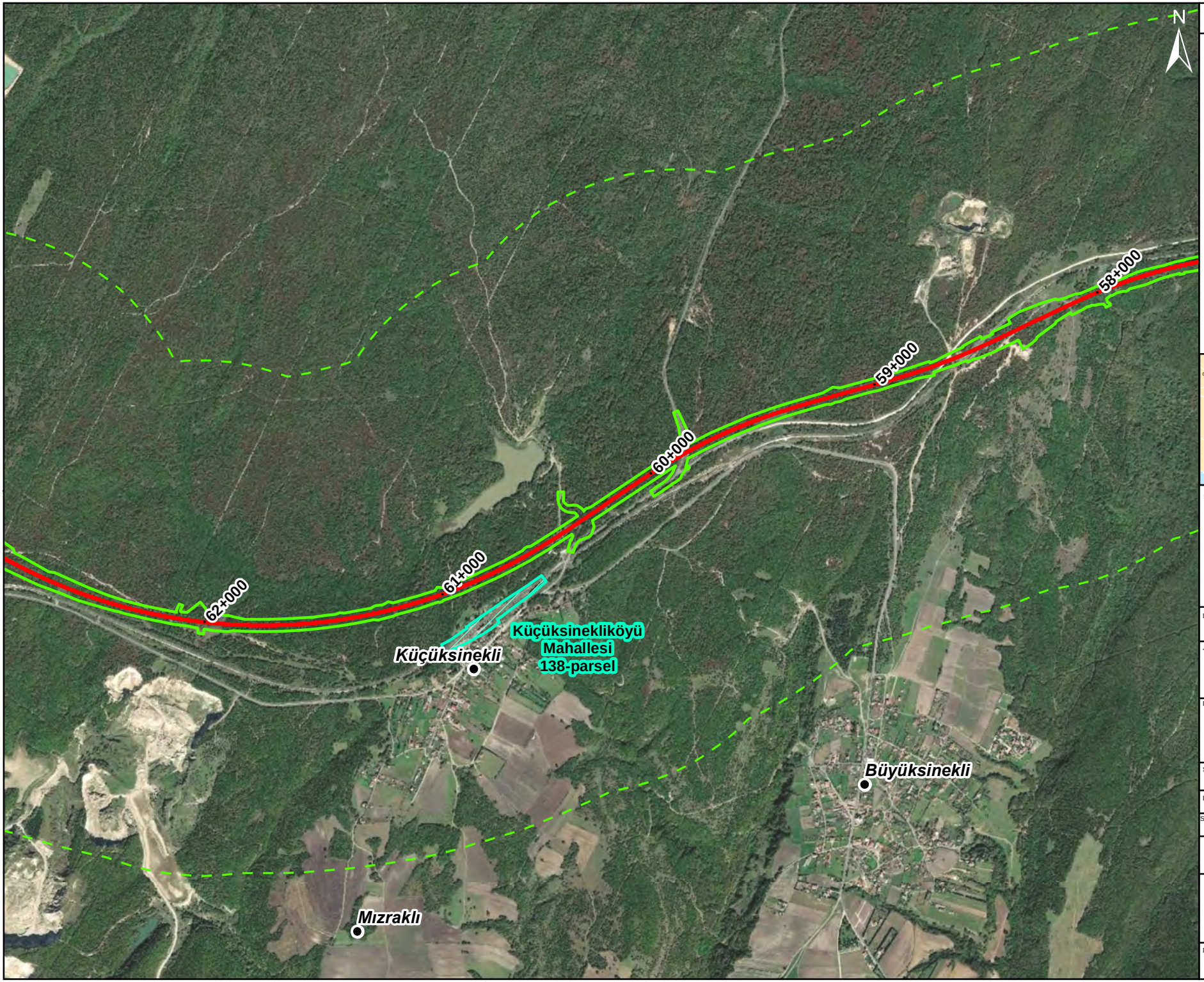
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Drawing Number
Figure 9-13

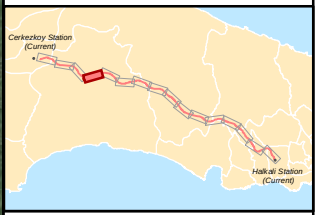
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Legend

- Town
- Proposed Railway Route
- Expropiation Corridor
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 9-14 - Cultural Heritage Assets

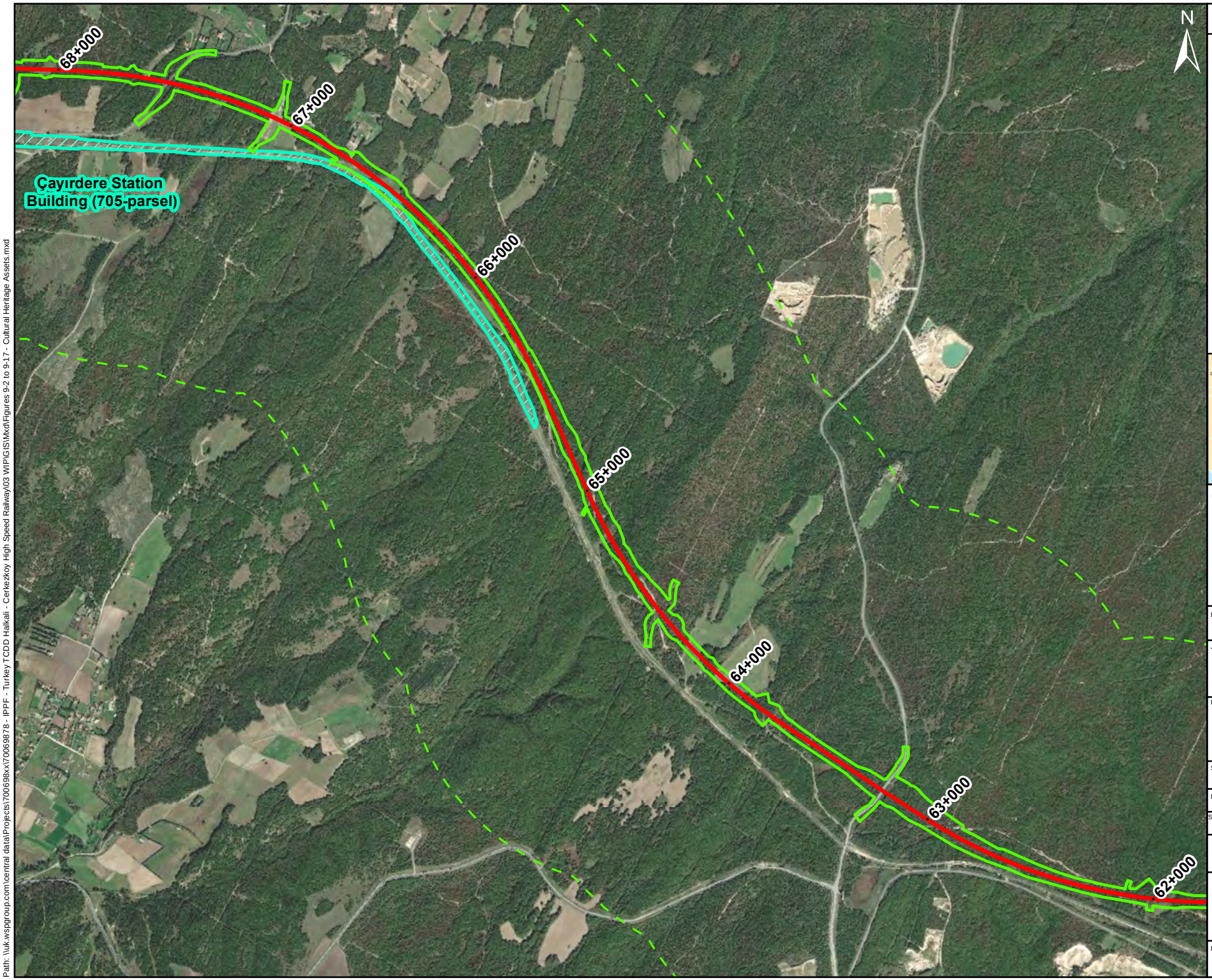
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Drawing Number: Figure 9-14

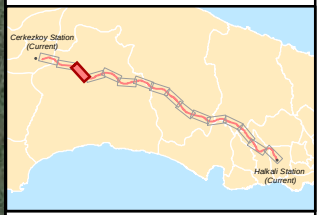
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Expropiation Corridor
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 9-15 - Cultural Heritage Assets

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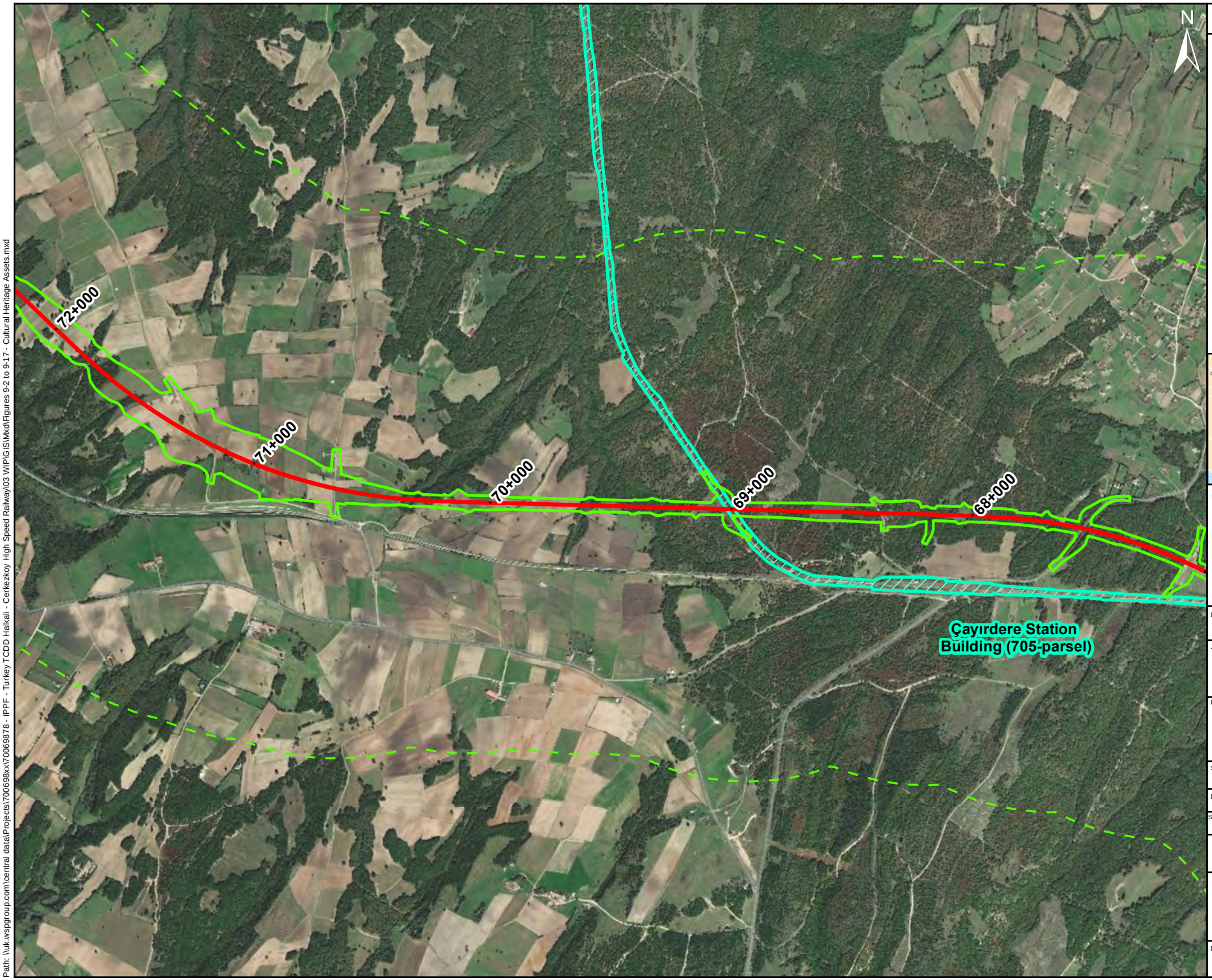
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PR	JW	DG	25/02/2021

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Drawing Number: Figure 9-15

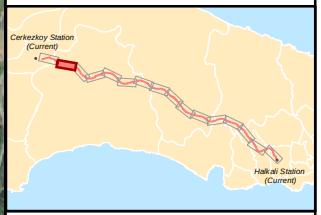
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Proposed Railway Route
- Expropiation Corridor
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure 9-16 - Cultural Heritage Assets

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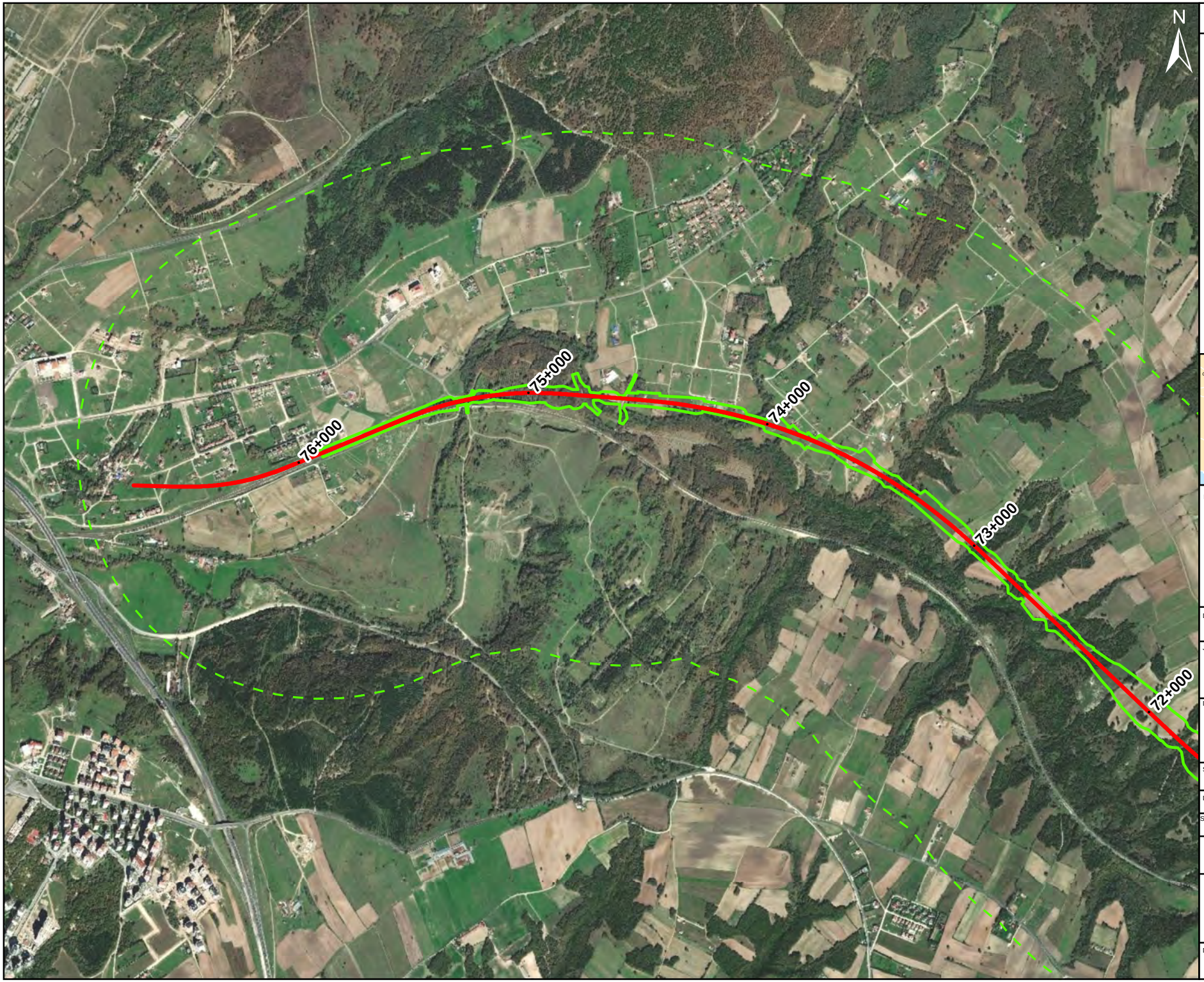
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Drawing Number
Figure 9-16

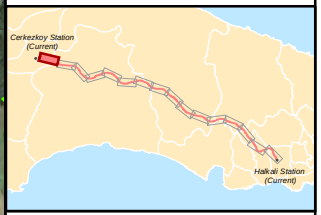
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Legend

- Proposed Railway Route
- Expropiation Corridor
- Buffer 1Km



Note:

Drawing Status
FINAL

Job Title:
HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title
Figure 9-17 - Cultural Heritage Assets

Scale at A4
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Stage 1 check	Stage 2 check	Originated	Date
PR	JW	DG	25/02/2021

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Drawing Number
Figure 9-17

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Appendix P

CULTURAL HERITAGE SITE WALKOVER SURVEY (CHAPTER 9: CULTURAL HERITAGE)

Public

The walkover survey for Cultural Heritage was undertaken by Uğur Dağ of Cinar Engineering Consultancy from 02/02/2020 to 05/07/2020. The detailed results of the site walkover are shown in Table P-1.

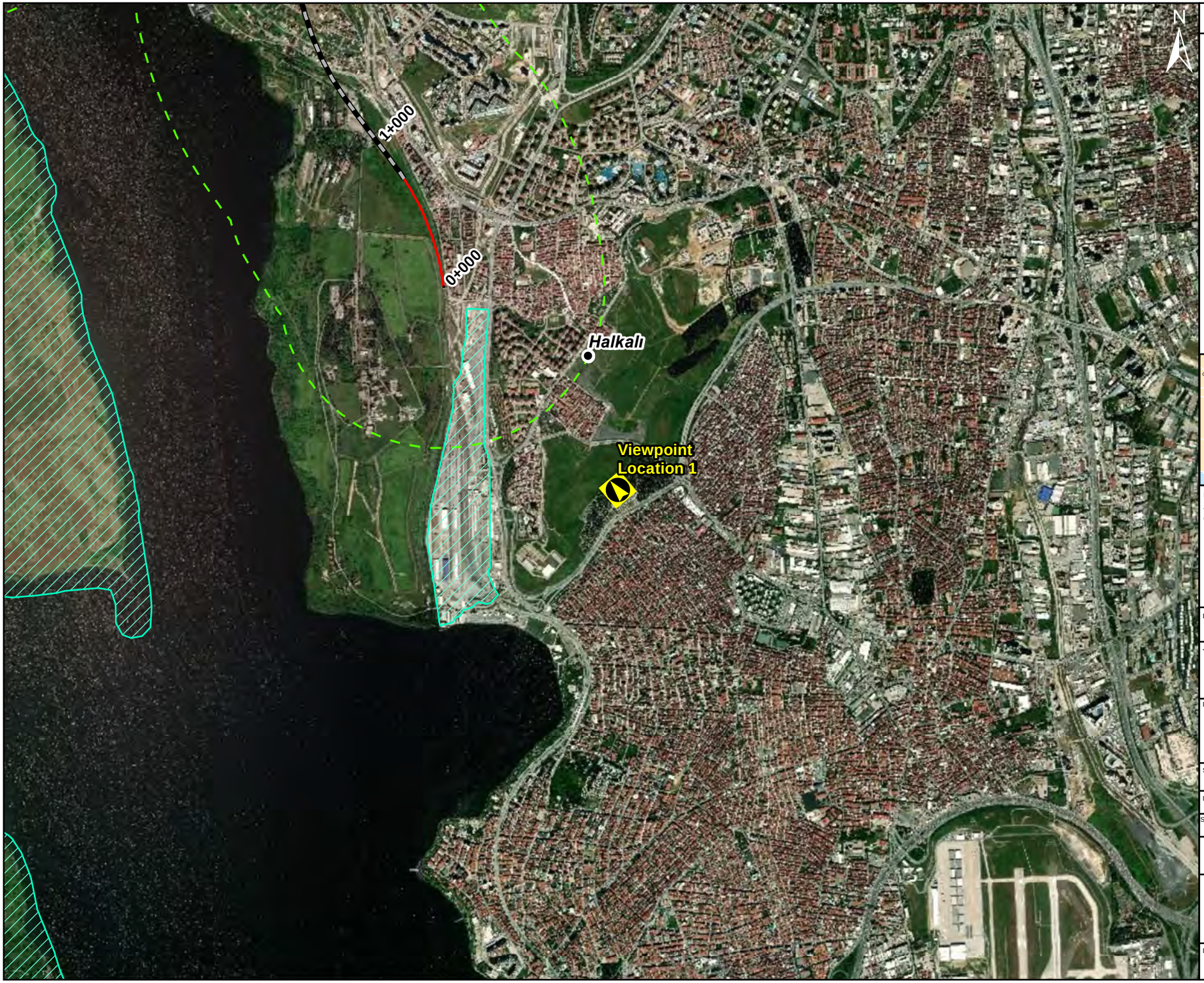
Table P-1 – Summary of Walkover Survey

Site	Location	Walkover Survey Observations
Parcel 705 - Çayırdere Station Building	İstanbul-Silivri / Çayırdere Neighborhood Parcel 705	The Historic Station building, which is believed to be from the Early Republic Period of Turkey, was observed as part of the Parcel 705. The building is located approximately 150m south of the expropriation corridor. There were no other historical or archaeological remains noticed within the area and no business, agricultural activity or settlement within the area. The village road, to the east, was also noticed to contain little traffic.
Area-7 / Anastasuis Wall Intersection Area	Istanbul-Silivri / Kurfallı Neighbourhood	The Anastasiusian Walls are believed to have been built between 491 – 512AD by the Byzantine Imperial forces. During the site visit observing ruins were no possible due to the thick forest cover. Within the area 1 piece of ceramic from the Byzantine Period was identified.
Parcel 1005 - Kabakça Train Station Building	Istanbul- Çatalca / Kurfallı Neighbourhood	The asset comprises station and auxiliary buildings built in the Early Republican Period. The state buildings are private property and hired out. The station structures, at the entrance of the Kabakça neighbourhood have been restored. The surrounding includes a wire fencing for security purposes. Within the 1005 parcel no historical or archaeological assets were identified.
Area 6	Istanbul- Çatalca / İnceğiz Neighbourhood	No Cultural Heritage Assets were identified during the site walkover
Area 5	İstanbul- Çatalca / Bahşayiş Neighborhood	No Cultural Heritage Assets were identified during the site walkover. A round mark, within private property, appears to belong to a landscape study
Bahşayış Redoubt	İstanbul- Çatalca / Bahşayiş Mahallesi	The area is a redoubt complex which comprises of several, different military bunkers. The visible bunkers are well preserved, but the overall area has been neglected with the bunkers being filled with rubbish and rubble. The main structures of the redoubt and the bunkers are located outside the expropriation corridorhowever, part of the boundary protection is within the expropriation corridor.
Area 4	İstanbul- Çatalca / Bahşayiş Neighborhood	The area contains an abandoned farmhouse which contains some construction waste. Within the area of the farm there were no cultural heritage assets observed.

Site	Location	Walkover Survey Observations
Kaleiçi Historical Bridge	İstanbul-Çatalca/Kaleiçi Mahallesi	The bridge remains have been protected by Law (2863) as a historical building. The feet of the bridge survive with a modern concrete platform added to the feet within the last 50 years in order to allow it to be used as a road. A viaduct has also been built on this bridge within the last decade.
Military Bunker	İstanbul-Arnavutköy / Yeşilbayır Neighborhood	The bunker is located within an agricultural field and protected under law as a registered historical building. The condition is generally good, and the bunker is covered with wild plants. The bunker was built during World War II to protect against the attack of the German Army.
Area-3	İstanbul-Arnavutköy / Ömerli Neighborhood	No cultural heritage assets are located within the area.
Ömerli Traditional House	İstanbul-Arnavutköy / Ömerli Neighborhood	On this area there is a traditional house which has been protected by law as a historical building. The building is an example of registered civil architecture built in the Early Republic Period. The house comprises of 2 floors and has a well in the courtyard which is still active. The house is located in the centre of the settlement.
Ispartakule Train Station and Old Yoğurthane Building	İstanbul-Başakşehir / Hoşdere Neighborhood	The station building and the Old Yoğurthane Building is protected by law as a registered historical building. The Yogurthane Building was likely built in the late Ottoman period. The main station building, and additional buildings were probably built in the Early Republican Period. The station buildings are within the project impact area. The structures survive well and are still in use.
Area-1	İstanbul-Avcılar / Firuzköy Neighborhood	The area is largely pasture land and woodland with an existing north to south train line. There are ruins of Byzantine settlement about 1km south of the area. The area is located within a 1st degree archaeological protected site. A few ceramic sherds were observed on the field surface and the area is used for agricultural purposes.
Area 2	İstanbul- Avcılar / Firuzköy	The area is located within a private farm and comprises of a flat settlement. The area is located within 1st and 3rd degree archaeological protected sites which has been protected by law. The area is private property. No cultural heritage assets were observed.

Appendix Q

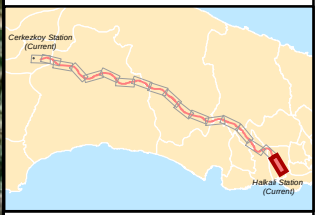
REPRESENTATIVE PHOTOGRAPHS (CHAPTER 10: LANDSCAPE AND VISUAL)



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Landscape Visual Observations
- Proposed Railway Route
- Tunnel (TBM - Double Tube)
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status

FINAL

Job Title:

HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title

Figure 10-3 - Representative Viewpoint Locations

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Drawing Number

Figure 10-3

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Legend

- Town
- Landscape Visual Observations
- Proposed Railway Route
- Tunnel (TBM - Double Tube)
- Tunnel (Cut - Cover)
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Archaeological
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 10-4 - Representative Viewpoint Locations

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Drawing Number: Figure 10-4

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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Landscape Visual Observations
- Proposed Railway Route
- Tunnel (TBM - Double Tube)
- Tunnel (Cut - Cover)
- Fencing
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Archaeological
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 10-5 - Representative Viewpoint Locations

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Drawing Number: Figure 10-5

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Legend

- Town
- Landscape Visual Observations
- 20th Century Military Bunkers and Ditches
- Proposed Railway Route
- Tunnel (NATM)
- Tunnel (Cut - Cover)
- Fencing
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 10-6 - Representative Viewpoint Locations

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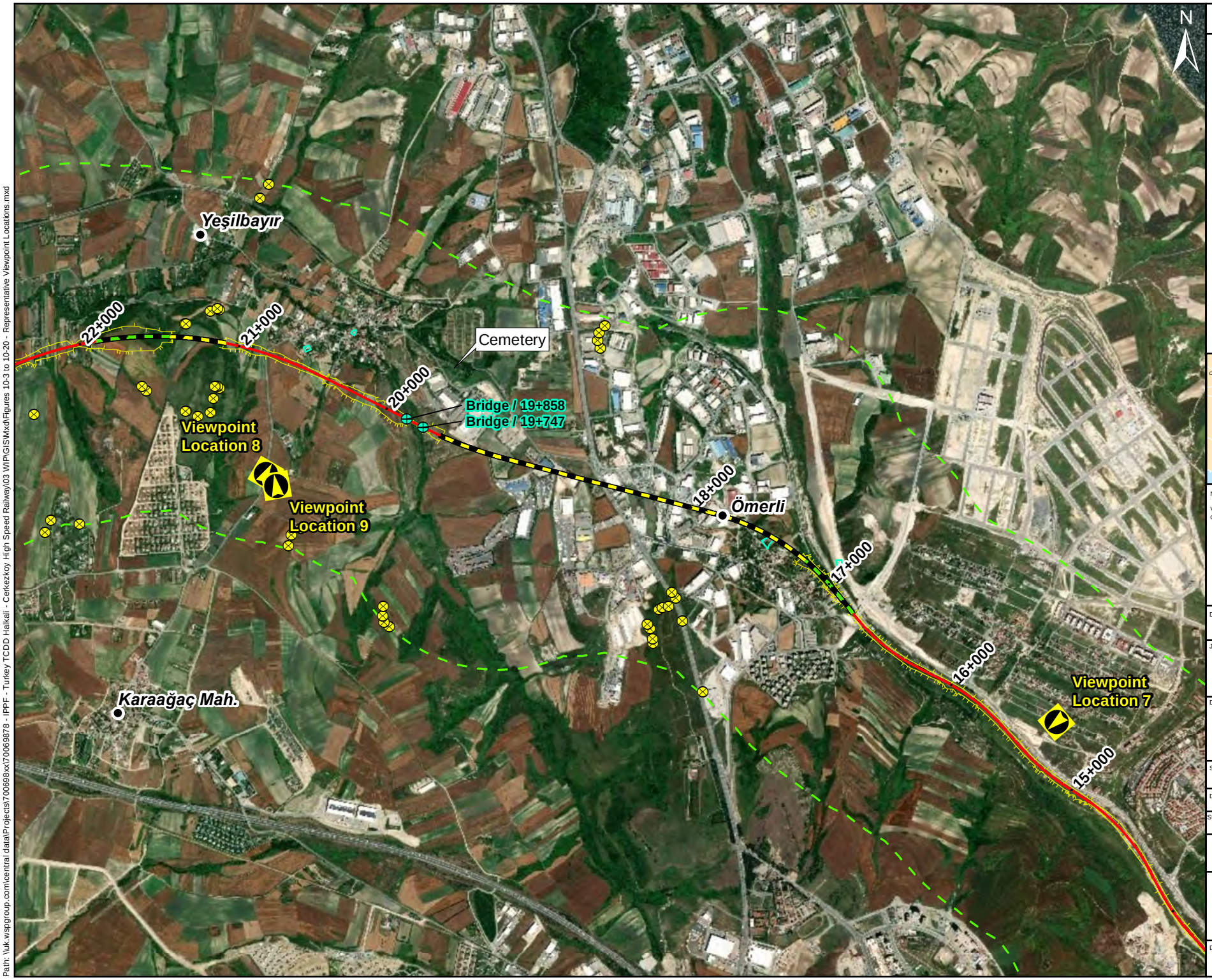
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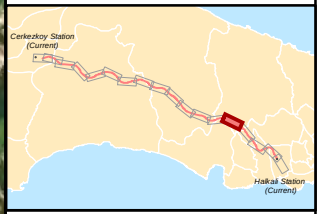
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Legend

- Town
- Landscape Visual Observations
- 20th Century Military Bunkers and Ditches
- Bridges
- Proposed Railway Route
- Tunnel (NATM)
- Tunnel (Cut - Cover)
- Fencing
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status

FINAL

Job Title:

HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title

Figure 10-7 - Representative Viewpoint Locations

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KM	JW	DG	19/03/2021

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Drawing Number

Figure 10-7

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Legend

- Town
- Landscape Visual Observations
- 20th Century Military Bunkers and Ditches
- Bridges
- Proposed Railway Route
- Tunnel (NATM)
- Tunnel (Cut - Cover)
- Fencing
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status

FINAL

Job Title:

HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title

Figure 10-8 - Representative Viewpoint Locations

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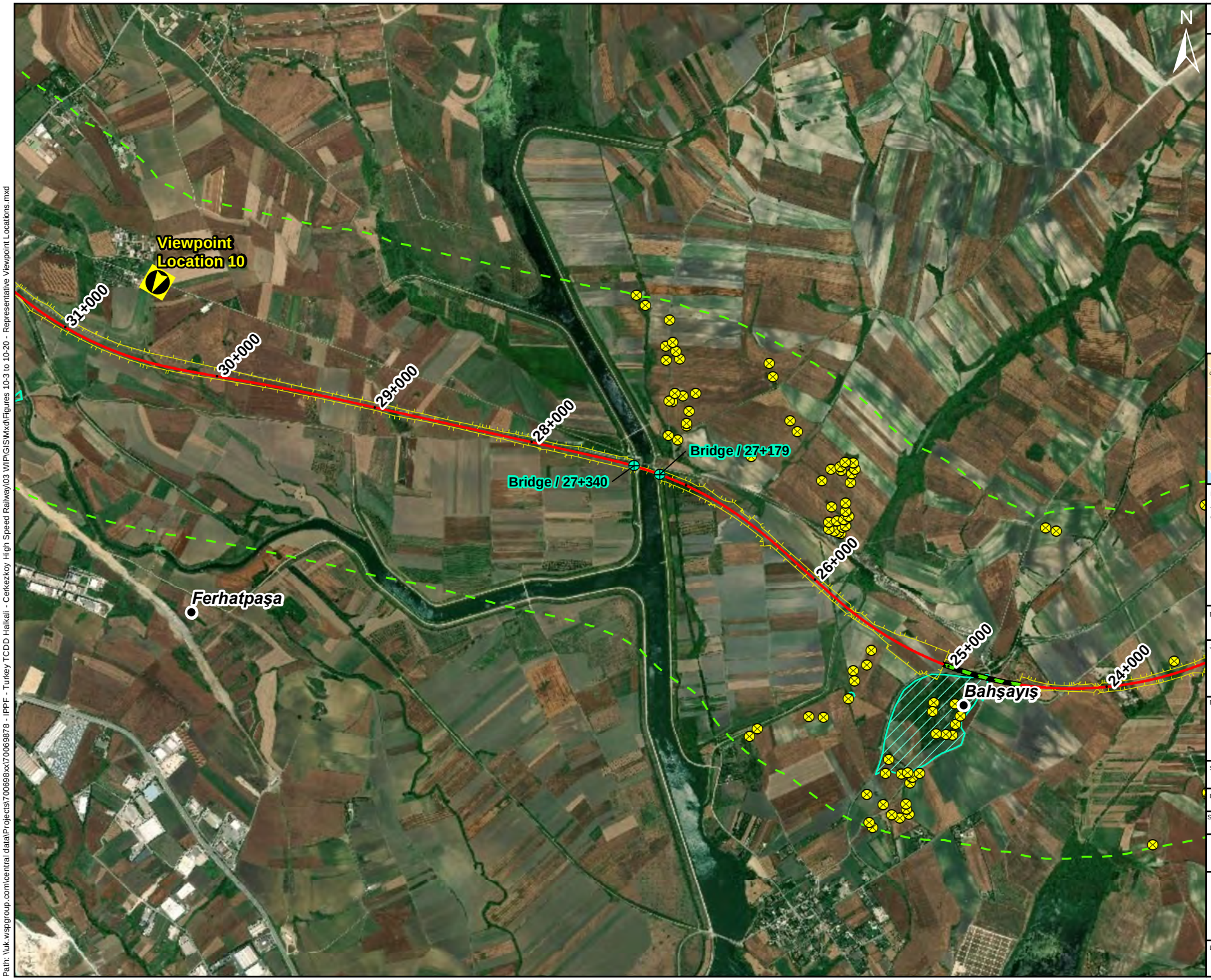
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Figure 10-8

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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Landscape Visual Observations
- 20th Century Military Bunkers and Ditches
- Bridges
- Proposed Railway Route
- Tunnel (Cut - Cover)
- Fencing
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 10-9 - Representative Viewpoint Locations

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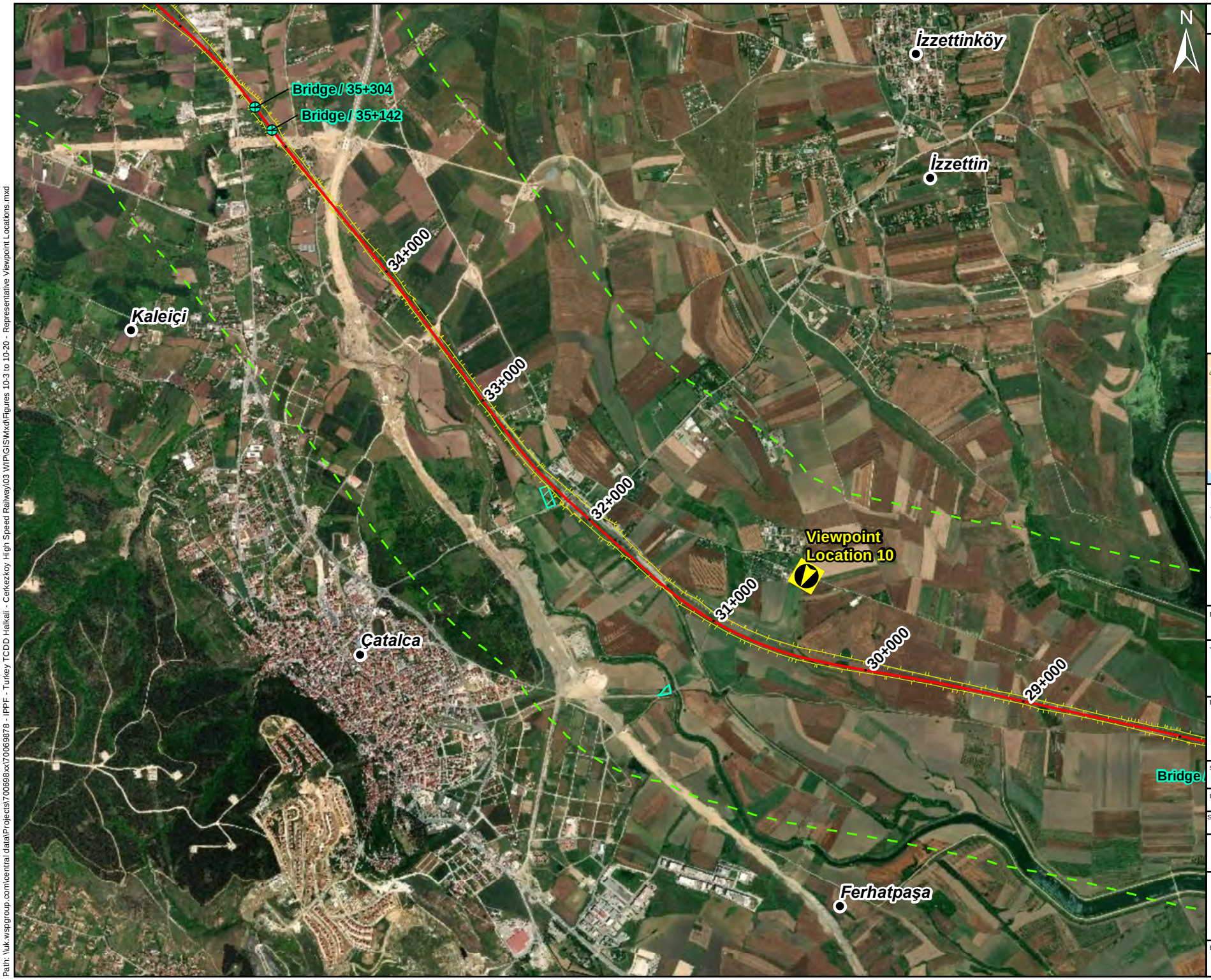
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KM	JW	DG	19/03/2021

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Drawing Number: Figure 10-9

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Legend

- Town
- Landscape Visual Observations
- Bridges
- Proposed Railway Route
- Fencing
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status

FINAL

Job Title:

HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title

Figure 10-10 - Representative Viewpoint Locations

Scale at A4

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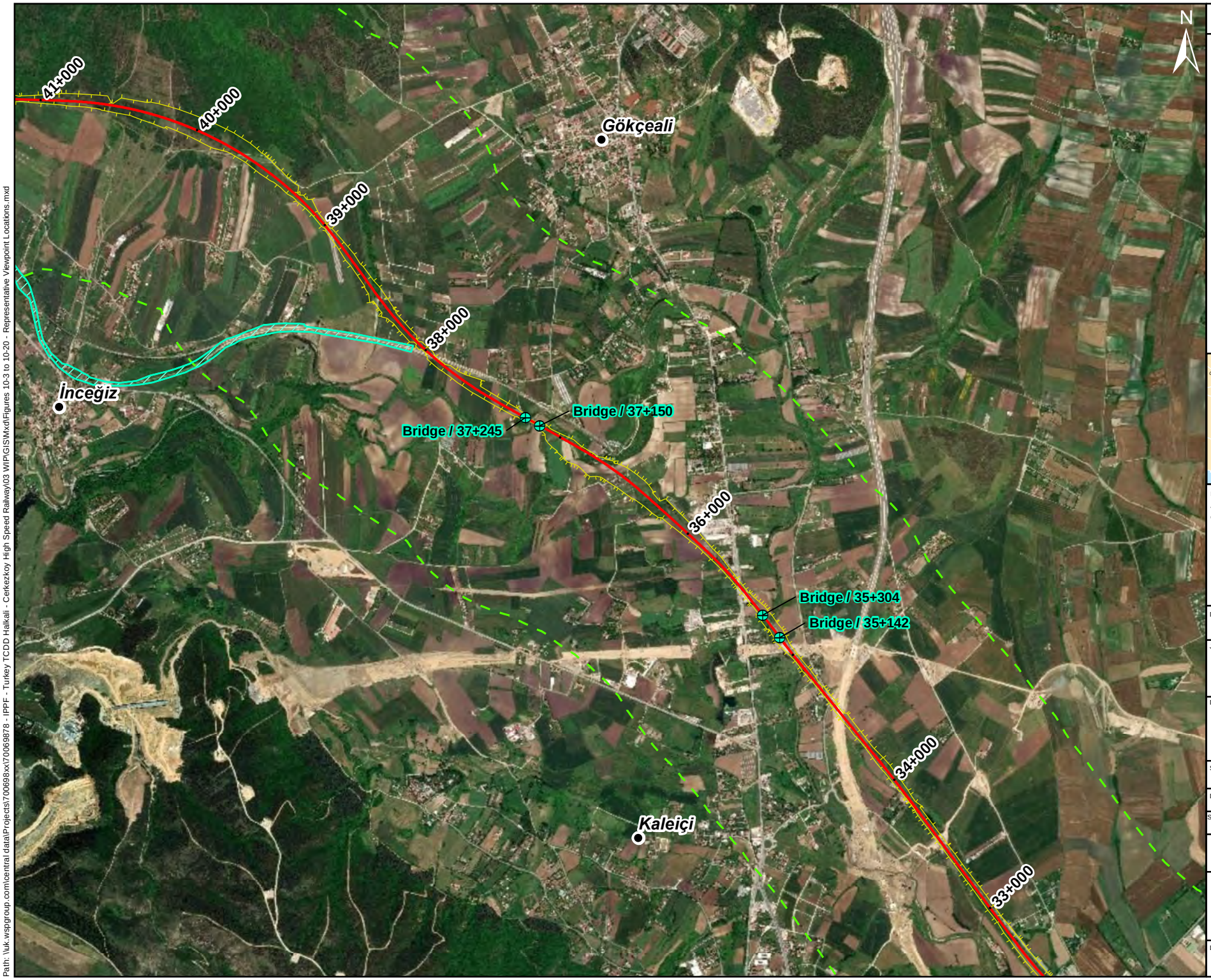
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Drawing Number

Figure 10-10

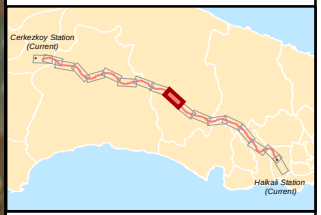
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Bridges
- Proposed Railway Route
- Fencing
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 10-11 - Representative Viewpoint Locations

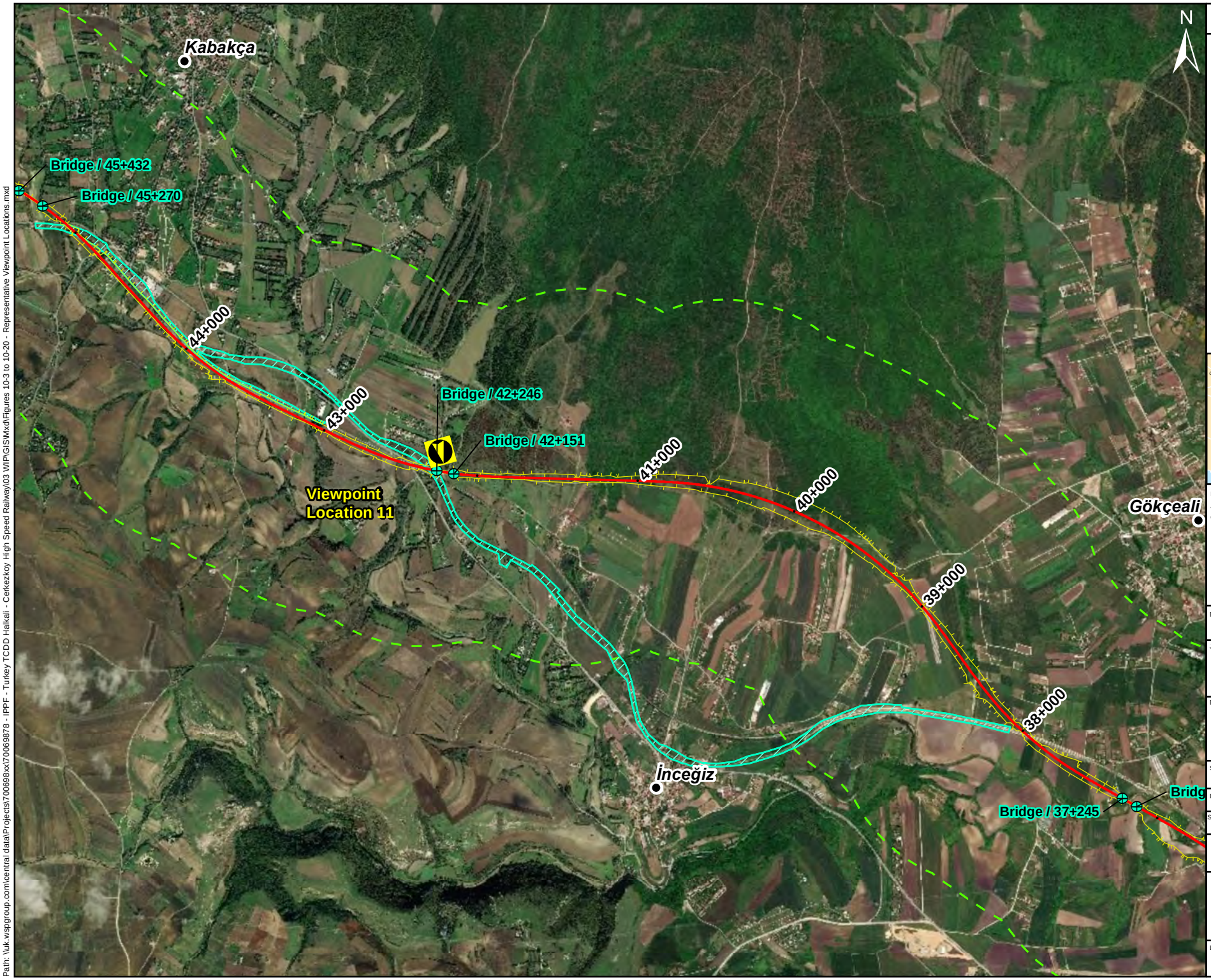
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Landscape Visual Observations
- Bridges
- Proposed Railway Route
- Fencing
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

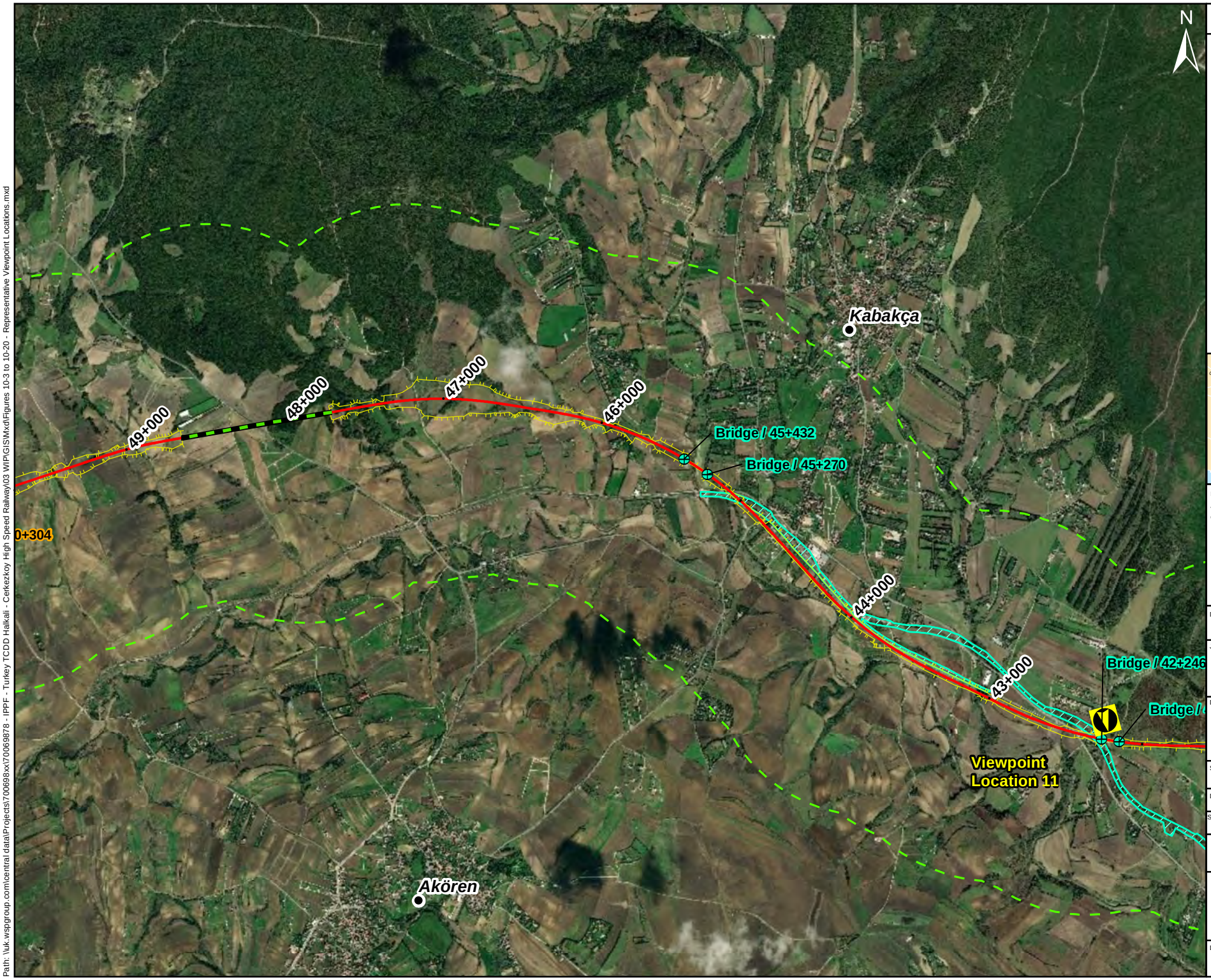
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Drawing Number: Figure 10-12



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Landscape Visual Observations
- Bridges
- Proposed Railway Route
- Tunnel (Cut - Cover)
- Fencing
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 10-13 - Representative Viewpoint Locations

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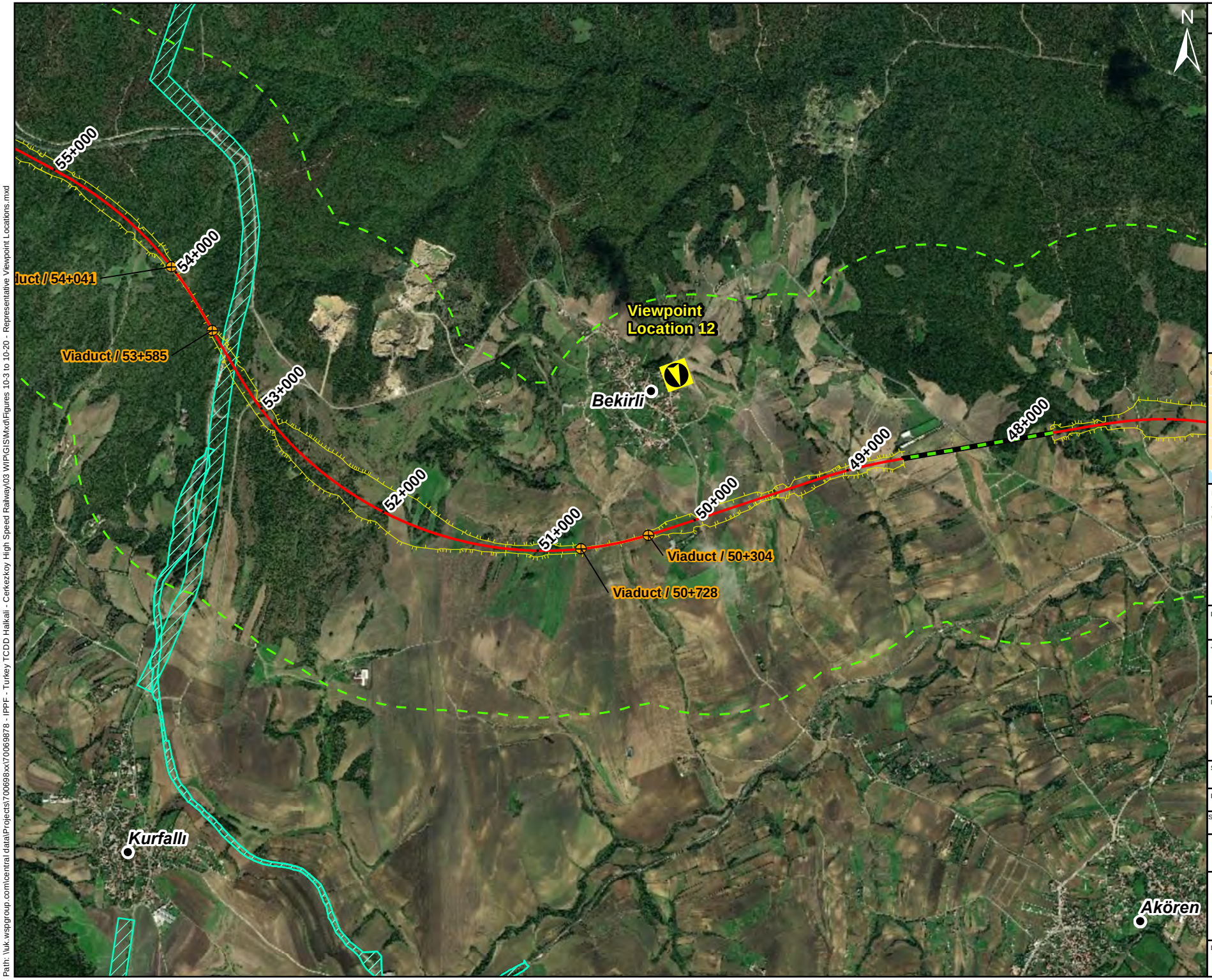
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KM	JW	DG	19/03/2021

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Drawing Number: Figure 10-13

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Legend

- Town
- Landscape Visual Observations
- Viaducts
- Proposed Railway Route
- Tunnel (Cut - Cover)
- Fencing
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 10-14 - Representative Viewpoint Locations

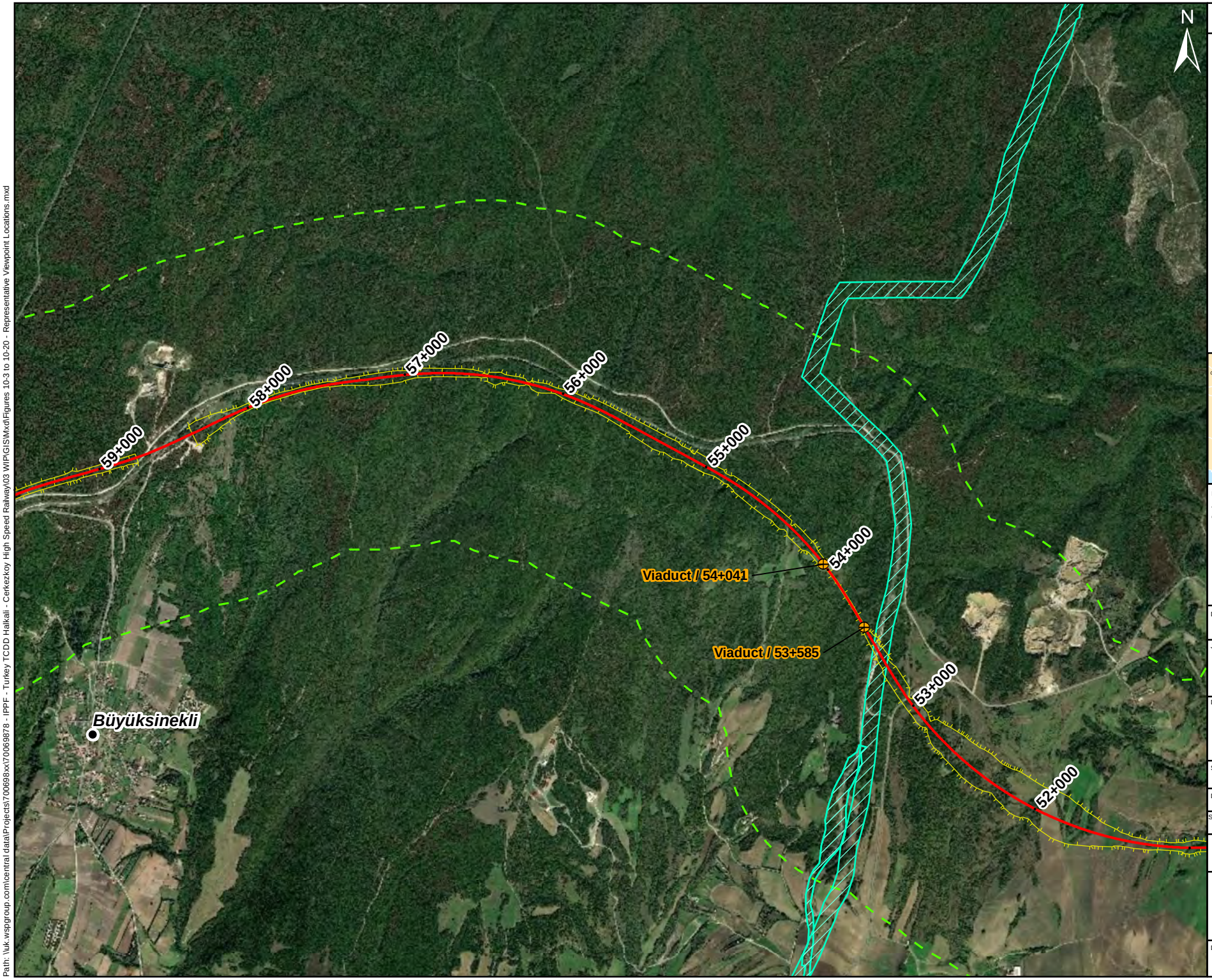
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KM	JW	DG	19/03/2021

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Drawing Number: Figure 10-14

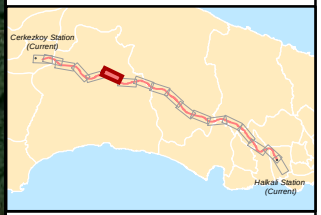
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Viaducts
- Proposed Railway Route
- Fencing
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status

FINAL

Job Title:

HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title

Figure 10-15 - Representative Viewpoint Locations

Scale at A4

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KM	JW	DG	19/03/2021

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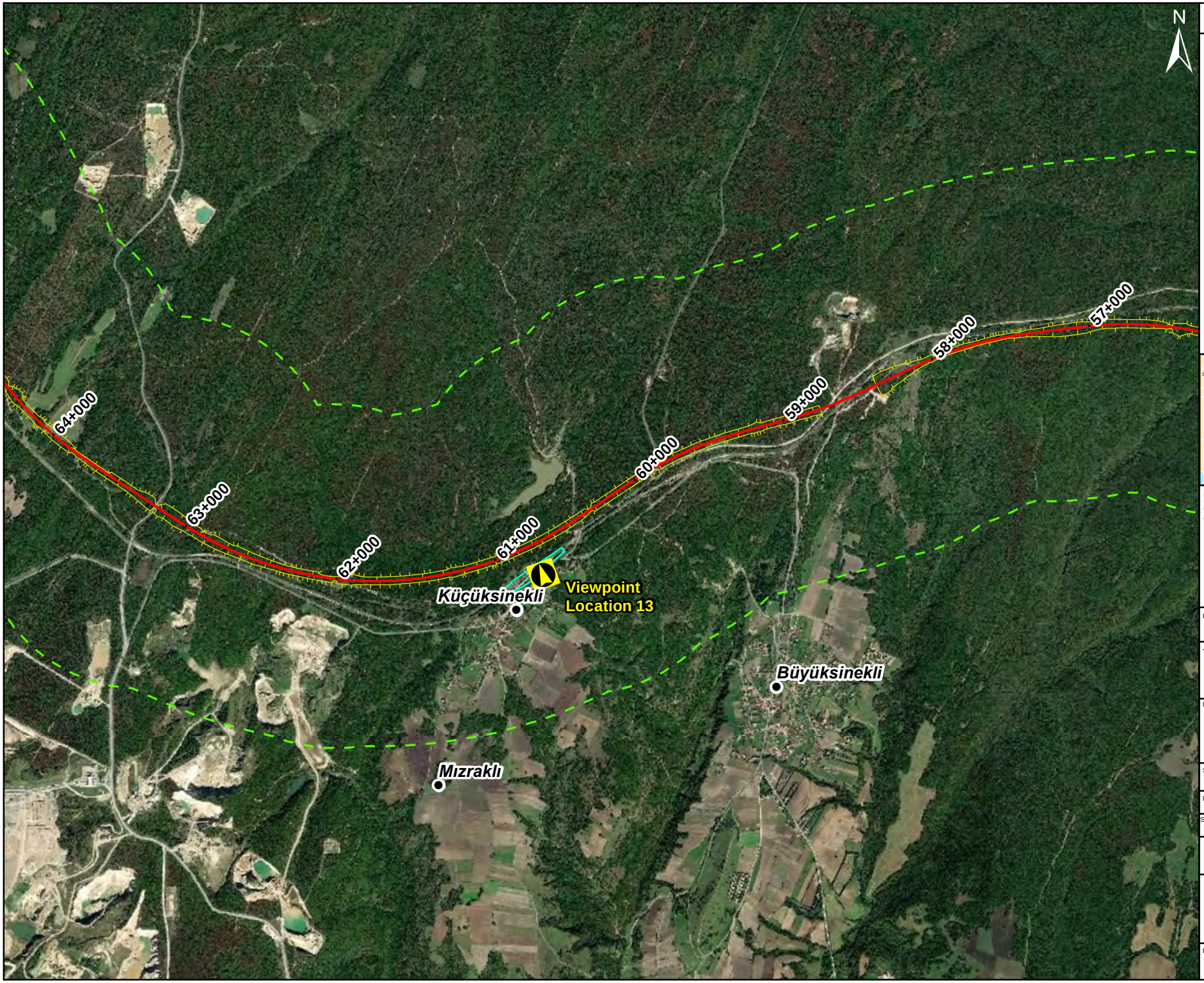
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Drawing Number

Figure 10-15

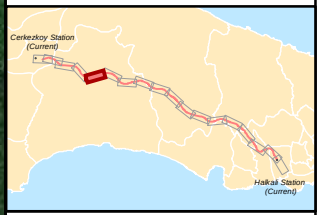
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Landscape Visual Observations
- Proposed Railway Route
- Fencing
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status

FINAL

Job Title:

HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title

Figure 10-16 - Representative Viewpoint Locations

Scale at A4

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DG			
Stage 1 check	Stage 2 check	Originated	Date
KM	JW	DG	19/03/2021

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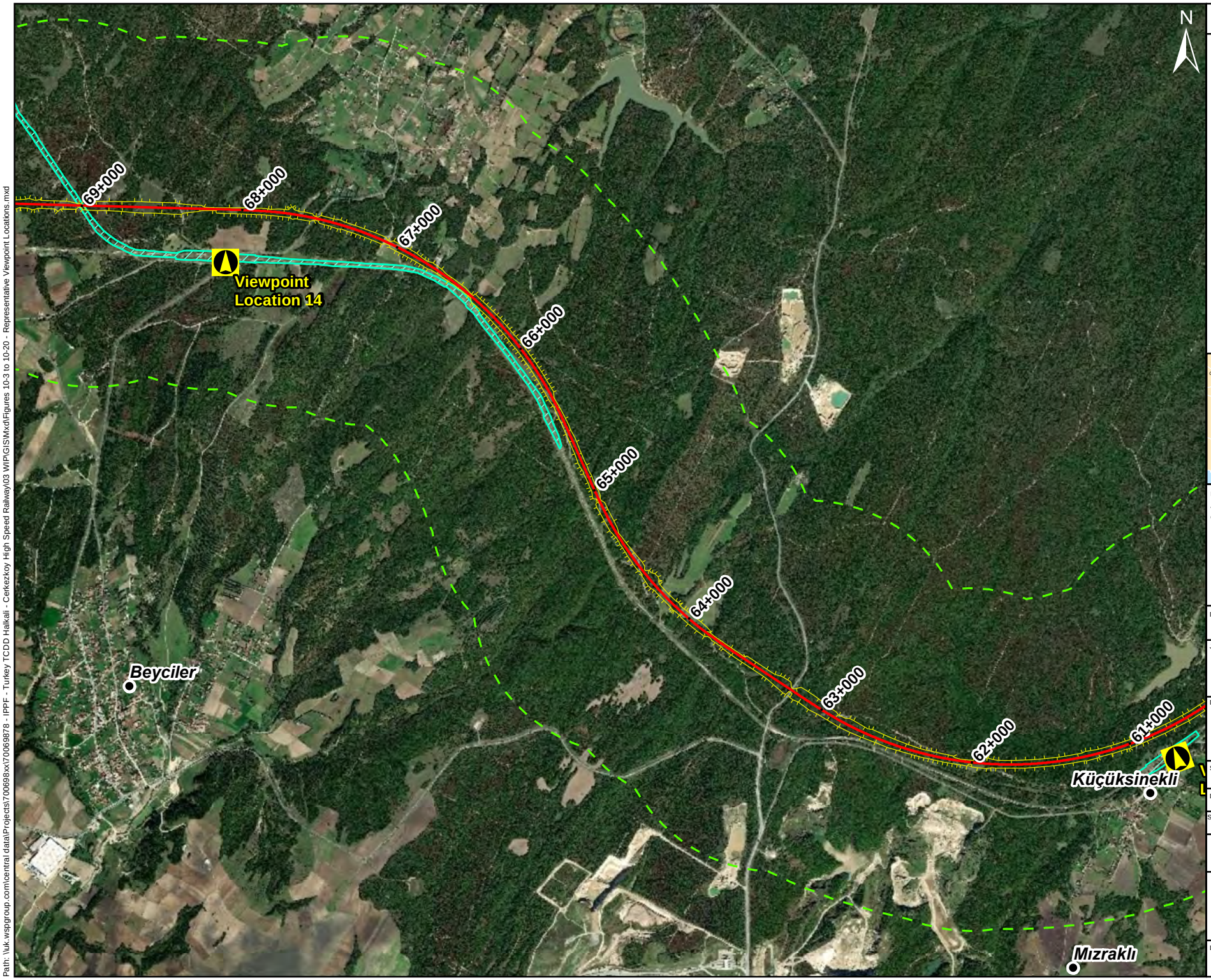
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Drawing Number

Figure 10-16

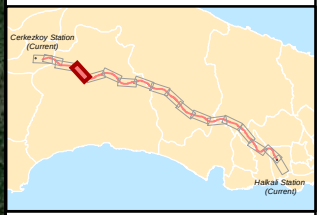
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Landscape Visual Observations
- Proposed Railway Route
- Fencing
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status

FINAL

Job Title:

HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title

Figure 10-17 - Representative Viewpoint Locations

Scale at A4

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KM	JW	DG	19/03/2021

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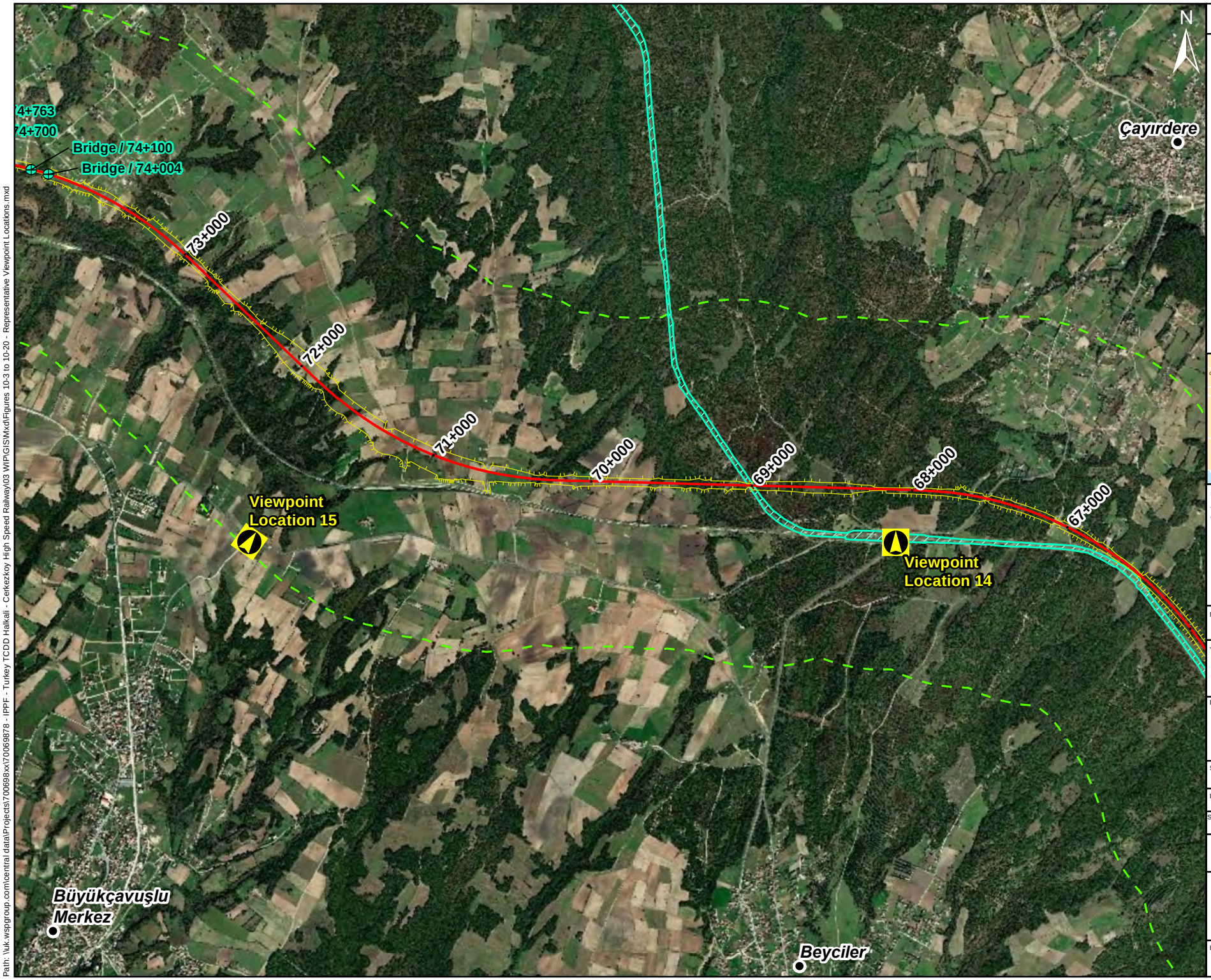
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Drawing Number

Figure 10-17

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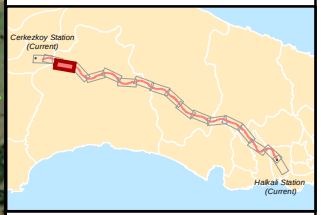


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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Landscape Visual Observations
- Bridges
- Proposed Railway Route
- Fencing
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 10-18 - Representative Viewpoint Locations

Scale at A4: 1:30,000

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DG			
Stage 1 check	Stage 2 check	Originated	Date
KM	JW	DG	19/03/2021

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wsp

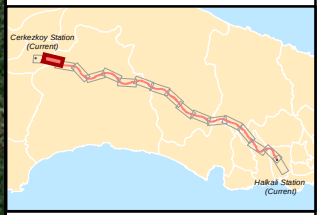
Drawing Number: Figure 10-18



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Landscape Visual Observations
- Bridges
- Proposed Railway Route
- Fencing
- Heritage Assets Registered by Istanbul (No:1) Regional Board for the Protection of Cultural Assets
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status: FINAL

Job Title: HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title: Figure 10-19 - Representative Viewpoint Locations

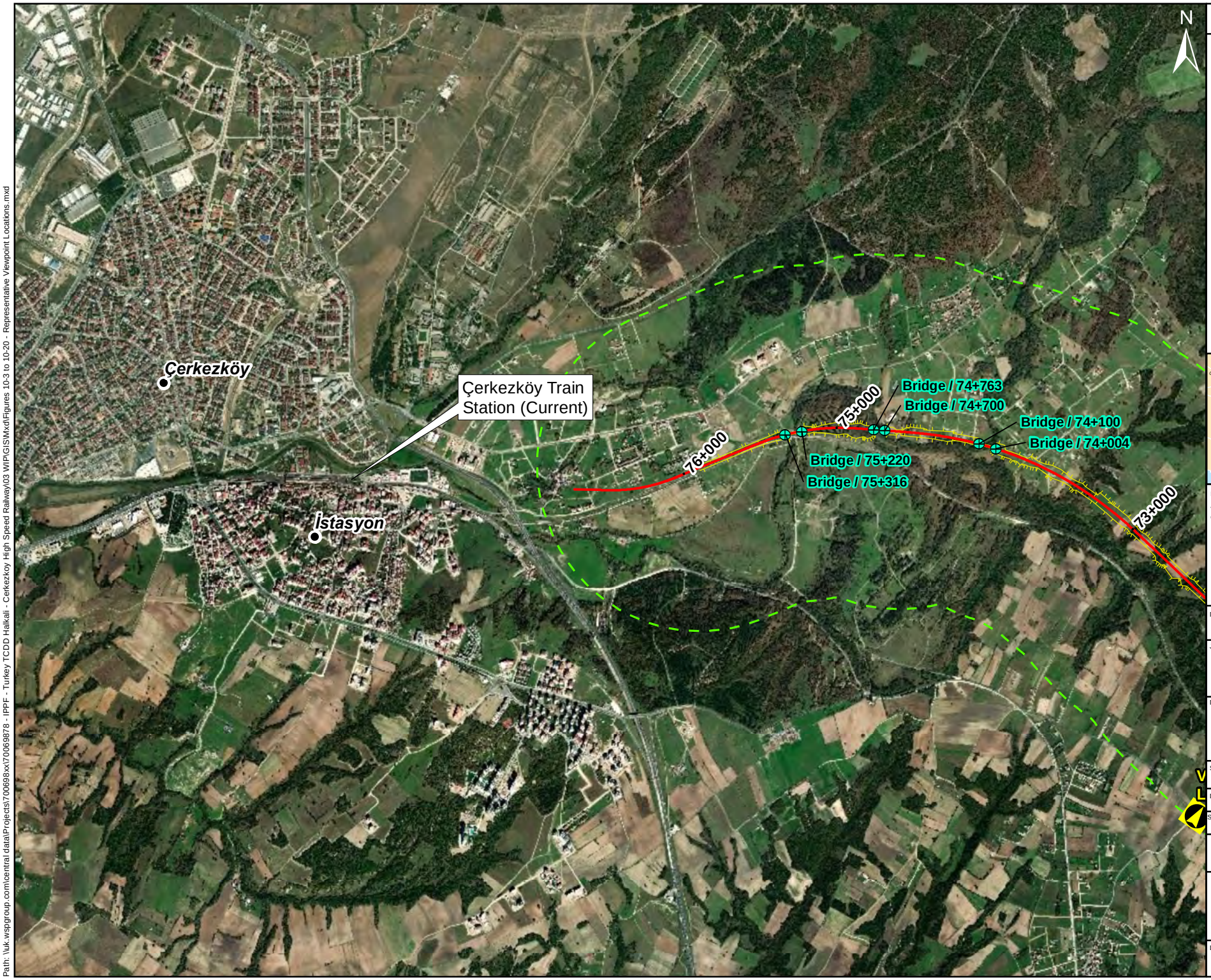
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Drawn			
DG			
Stage 1 check	Stage 2 check	Originated	Date
KM	JW	DG	19/03/2021

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Drawing Number: Figure 10-19

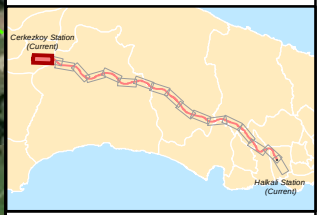
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THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Town
- Landscape Visual Observations
- Bridges
- Proposed Railway Route
- Fencing
- Buffer 1Km



Note:

Viewpoint Locations based on the visual observations made on the 07/07/2020.

Drawing Status

FINAL

Job Title:

HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Drawing Title

Figure 10-20 - Representative Viewpoint Locations

Scale at A4

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KM	JW	DG	19/03/2021

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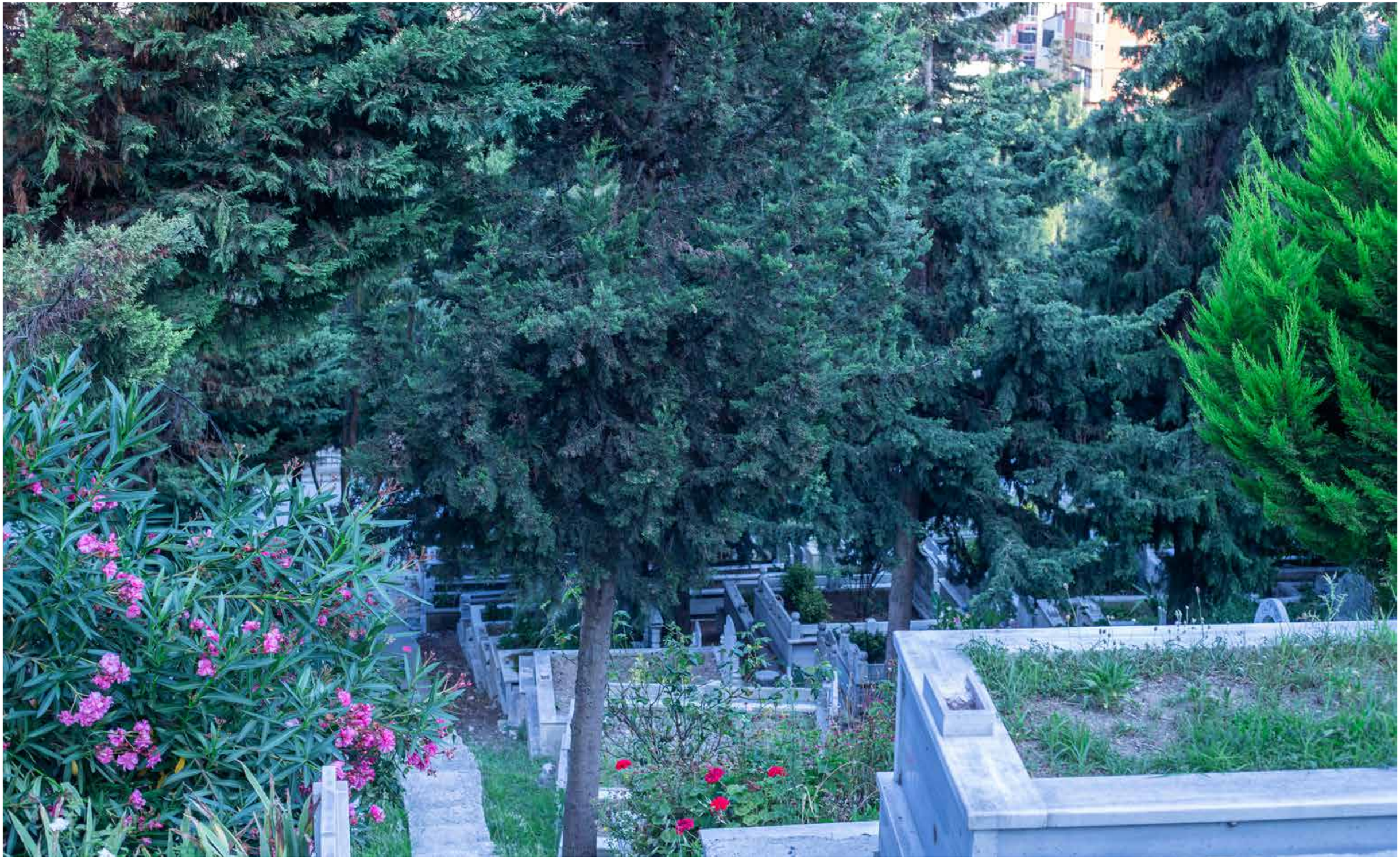
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Drawing Number

Figure 10-20

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Viewpoint 1 - View looking north-west from Canary Cemetery, at eastern end of Project towards Halkali Station

Date and Time: 07/07/20 18:59

Coordinate: 41.01844 - 28.77702

Camera model: Canon EOS-1D X Mark II

Camera lens: 50mm f/1.8

Viewpoint 2 - View looking in a south-westerly direction from Karaca Sokak (Sk), along the urban fringe of Yarimburgaz.

Date and Time: 07/07/20 20:28

Coordinate: 41.05654 - 28.75019

Camera model: Canon EOS-1D X Mark II

Camera lens: 50mm f/1.8

TCDD Halkali – Cerkezkoy High Speed Railway
Figure 10.22



Viewpoint 3 - View looking in a north-westerly direction from the southern end of Sumbul Sokak (Sk) within the Firuzkoy Neighbourhood.

Date and Time:
07/07/20 18:10

Coordinate:
41.05246 - 28.72763

Camera model:
Canon EOS-1D X Mark II

Camera lens:
50mm f/1.8

TCDD Halkali – Cerkezkoy High Speed Railway
Figure 10.23



Viewpoint 4 - View looking in a south-westerly direction from unnamed gravel road towards the offline section of the Project.

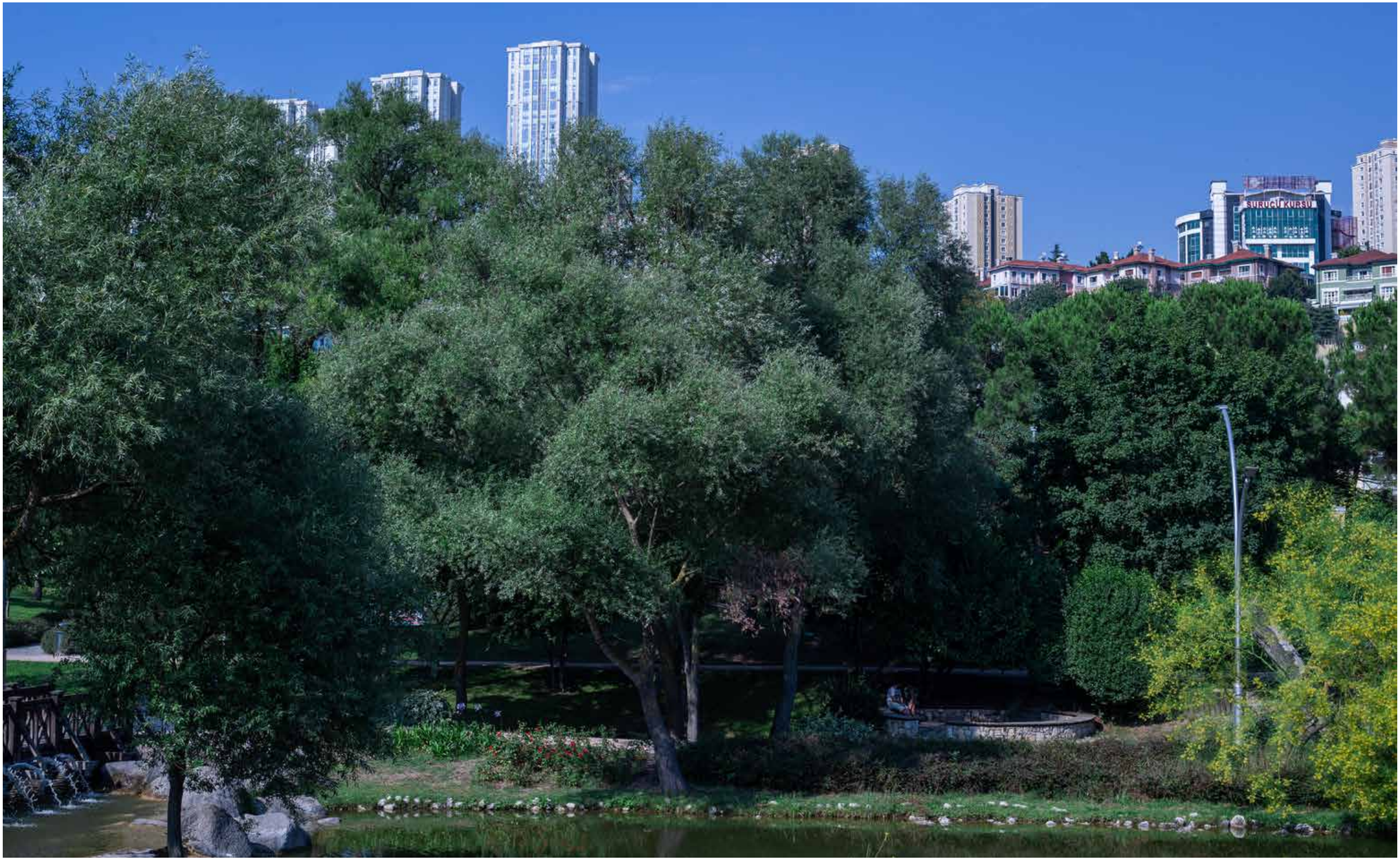
Date and Time:
07/07/20 17:53

Coordinate:
41.05228 - 28.72038

Camera model:
Canon EOS-1D X Mark II

Camera lens:
50mm f/1.8

TCDD Halkali – Cerkezkoy High Speed Railway
Figure 10.24



Viewpoint 5 - View looking east from Bahcesehir Golet

Date and Time: 07/07/20 17:00

Coordinate: 41.06907 - 28.69207

Camera model: Canon EOS-1D X Mark II

Camera lens: 50mm f/1.8

TCDD Halkali – Cerkezkoy High Speed Railway
Figure 10.25



Viewpoint 6 - View looking in a north-westerly direction from pedestrian footpath to the east of Vali Recap Yazicioglu Cd.

Date and Time: 07/07/20 17:30

Coordinate: 41.0689 - 28.69481

Camera model: Canon EOS-1D X Mark II

Camera lens: 50mm f/1.8



Viewpoint 7 - View looking west from Hurmet Sokak (Sk) representative of residential properties at Deliklikaya.

Date and Time: 07/07/20 16:31

Coordinate: 41.10714 - 28.65936

Camera model: Canon EOS-1D X Mark II

Camera lens: 50mm f/1.8

TCDD Halkali – Cerkezkoy High Speed Railway
Figure 10.27



Viewpoint 8 - View looking north-east from unnamed road towards offline section of the Project.

Date and Time: 07/07/20 16:04

Coordinate: 41.12189 - 28.60116

Camera model: Canon EOS-1D X Mark II

Camera lens: 50mm f/1.8

TCDD Halkali – Cerkezkoy High Speed Railway
Figure 10.28



Viewpoint 9 - View looking north-west from unnamed road towards offline section of the Project.

Date and Time: 07/07/20 16:00

Coordinate: 41.12163 - 28.6011

Camera model: Canon EOS-1D X Mark II

Camera lens: 50mm f/1.8



Viewpoint 10 - View looking south-west from Suleyman Bingol Cd towards the Project.

Date and Time: 07/07/20 15:25

Coordinate: 41.14754 - 28.49512

Camera model: Canon EOS-1D X Mark II

Camera lens: 50mm f/1.8



Viewpoint 11 - View looking north-east from Akoren-Incegiz Yolu.

Date and Time: 07/07/20 14:45

Coordinate: 41.20477 - 28.38521

Camera model: Canon EOS-1D X Mark II

Camera lens: 50mm f/1.8

TCDD Halkali – Cerkezkoy High Speed Railway
Figure 10.31



Viewpoint 12 - View looking south-east from Akincik Sk, along the eastern edge of Bekirli.

Date and Time: 07/07/20 14:19

Coordinate: 41.22776 - 28.30265

Camera model: Canon EOS-1D X Mark II

Camera lens: 50mm f/1.8

TCDD Halkali – Cerkezkoy High Speed Railway
Figure 10.32



Viewpoint 13 - View looking west from Okul Cd along the western edge of Sinekli.

Date and Time:
07/07/20 13:55

Coordinate:
41.23112 - 28.19359

Camera model:
Canon EOS-1D X Mark II

Camera lens:
50mm f/1.8

TCDD Halkali – Cerkezkoy High Speed Railway
Figure 10.33



Viewpoint 14 - View looking west from Cayirdere yolu.

Date and Time: 07/07/20 13:08

Coordinate: 41.26017 - 28.12453

Camera model: Canon EOS-1D X Mark II

Camera lens: 50mm f/1.8

TCDD Halkali – Cerkezkoy High Speed Railway
Figure 10.34



Viewpoint 15 - View looking north-east from Beyciler yolu towards the western end of the Project.

Date and Time:
07/07/20 12:31

Coordinate:
41.26014 - 28.07545

Camera model:
Canon EOS-1D X Mark II

Camera lens:
50mm f/1.8

TCDD Halkali – Cerkezkoy High Speed Railway
Figure 10.35



Viewpoint 1 - View looking north-west from Canary Cemetery, at eastern end of Project towards Halkali Station.



Viewpoint 2 - View looking in a south-westerly direction from Karaca Sokak (Sk), along the urban fringe of Yarimburgaz.



Viewpoint 3 - View looking in a north-westerly direction from the southern end of Sumbul Sokak (Sk) within the Firuzkoy Neighbourhood.



Viewpoint 4 - View looking in a south-westerly direction from unnamed gravel road towards the offline section of the Project.



Viewpoint 5 - View looking east from Bahcesehir Golet Park.



Viewpoint 6 - View looking in a north-westerly direction from pedestrian footpath to the east of Vali Recap Yazicioglu Cd.



Viewpoint 7 - View looking west from Hurmet Sokak (Sk) representative of residential properties at Deliklikaya.



Viewpoint 8 - View looking north-east from unnamed road towards offline section of the Project.



Viewpoint 9 - View looking north-west from unnamed road towards offline section of the Project.



Viewpoint 10 - View looking south-west from Suleyman Bingol Cd towards the Project.



Viewpoint 11 - View looking north-east from Akoren-Incegiz Yolu.



Viewpoint 12 - View looking south-east from Akincik Sk, along the eastern edge of Bekirli.



Viewpoint 13 - View looking west from Okul Cd along the western edge of Sinekli.



Viewpoint 14 - View looking west from Cayirdere yolu



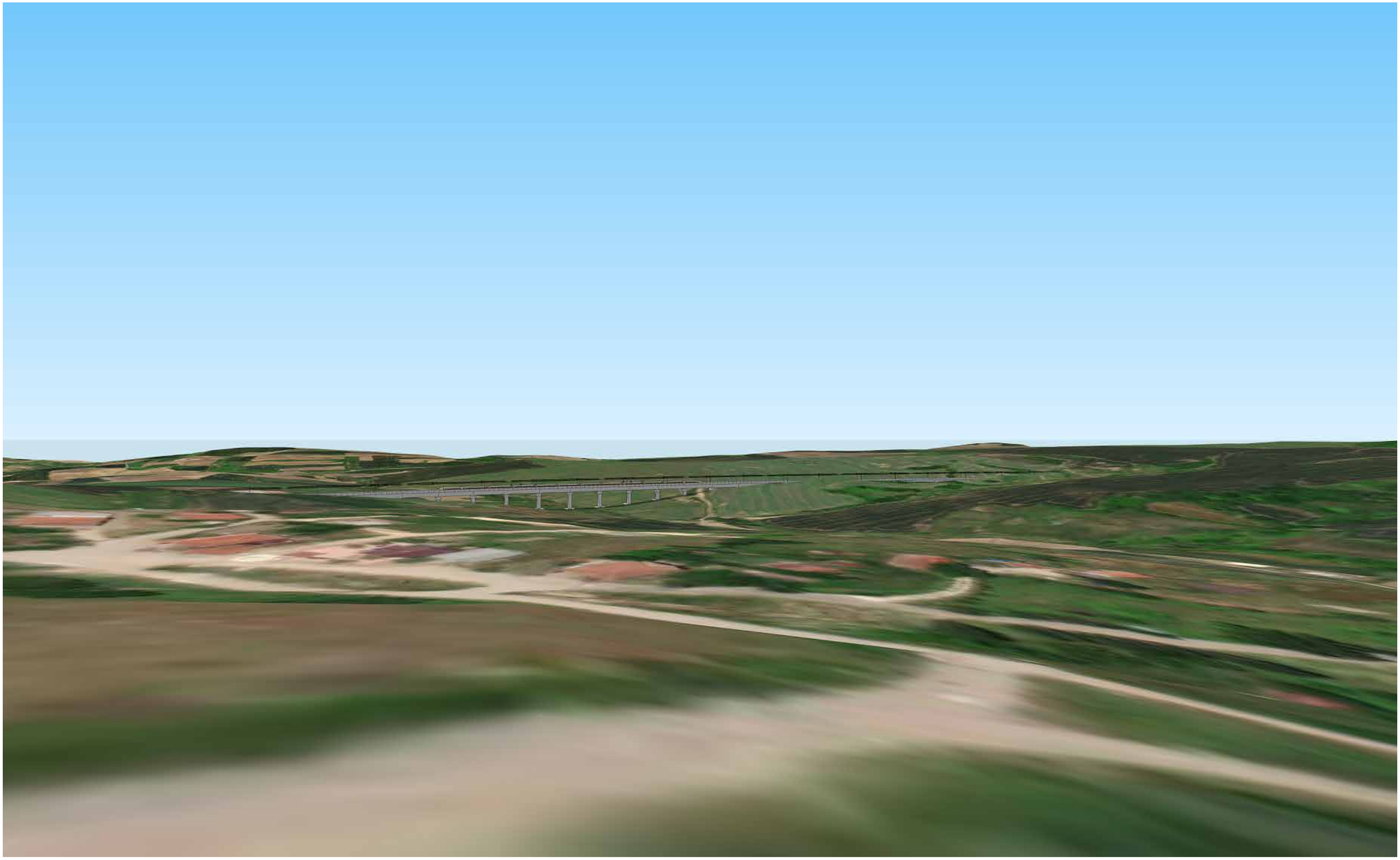
Viewpoint 15 - View looking north-east from Beyciler yolu towards the western end of the Project.



Viewpoint 7 - View looking west from Hurmet Sokak (Sk) representative of residential properties at Deliklikaya.



Viewpoint 8 - View looking north-east from unnamed road towards offline section of the Project.



Viewpoint 12 - Illustrative representation of the view looking south-east from Akincik Sk, along the eastern edge of Bekirli.

Appendix R

RAW DATA FOR EMISSIONS FROM MODAL SHIFT (CHAPTER 14: CLIMATE CHANGE)

GHG Summary ('000 tonnes)

Year	Without Project (WOP)			With Project (WP)		Saving
	Railway	Pax (road)	Freight (road)	Railway	Freight (road)	
2026	6.1	3.9	20.9	7.6	20.9	2.4
2027	6.3	4.1	22.0	7.9	22.0	2.5
2028	6.6	4.2	23.3	8.2	23.3	2.6
2029	7.0	4.3	24.6	8.6	24.6	2.7
2030	7.3	4.4	25.9	16.3	0.0	21.3
2031	7.4	4.5	27.4	16.9	0.0	22.3
2032	7.5	4.5	28.9	17.5	0.0	23.4
2033	7.6	4.6	30.5	18.2	0.0	24.5
2034	7.7	4.7	32.2	18.9	0.0	25.7
2035	7.8	4.7	34.0	19.6	0.0	26.9
2036	7.9	4.8	35.9	20.3	0.0	28.2
2037	8.0	4.8	37.9	21.1	0.0	29.6
2038	8.1	4.9	40.0	22.0	0.0	31.0
2039	8.2	5.0	42.2	22.9	0.0	32.6
2040	8.3	5.0	44.6	23.8	0.0	34.1
2041	8.4	5.1	45.0	24.1	0.0	34.4
2042	8.5	5.1	45.4	24.4	0.0	34.6

GHG Summary ('000 tonnes)						
Year	Without Project (WOP)			With Project (WP)		Saving
	Railway	Pax (road)	Freight (road)	Railway	Freight (road)	
2043	8.5	5.1	45.9	24.7	0.0	34.8
2044	8.6	5.1	46.3	25.0	0.0	35.1
2045	8.7	5.2	46.8	25.3	0.0	35.3
2046	8.8	5.2	47.2	25.6	0.0	35.6
2047	8.8	5.2	47.7	25.9	0.0	35.8
2048	8.9	5.2	48.1	26.2	0.0	36.0
2049	9.0	5.3	48.6	26.6	0.0	36.3
2050	9.1	5.3	49.1	26.9	0.0	36.5
2051	9.2	5.3	49.5	27.2	0.0	36.8
2052	9.3	5.3	50.0	27.6	0.0	37.0
2053	9.3	5.3	50.5	27.9	0.0	37.3
2054	9.4	5.4	51.0	28.3	0.0	37.5
2055	9.5	5.4	51.5	28.6	0.0	37.8
Total	**245.8**	**146.8**	**1192.6**	**644.1**	**90.7**	**850.5**

Appendix S

VULNERABILITY ASSESSMENT (CHAPTER 14: CLIMATE CHANGE)

VULNERABILITY ASSESSMENT

During construction, the following Project assets are sensitive to the climate variables as shown in the table below.

- Construction compound - including access roads, vegetation;
- Materials – earthworks, soils, concrete, ballast, subbase;
- Drainage;
- Plant and equipment – construction vehicles, security measures and barriers;
- Workforce – approximately 350 personnel will be operating out of each of the three construction compounds; and
- Workplace provisions - offices, dining halls and accommodation.

Due to the short timescales of the construction stage (five years), it is not anticipated that sea level would be a risk to the construction process and has therefore not been considered below.

Construction Phase: Sensitivity to Weather and Climate

Project Element	Climate Variable	Description of Sensitivity	Sensitivity
Construction Compounds	Average Precipitation	Increase in dust.	Moderate
	Drought	Drying out and cracking of construction compound during drought.	Moderate
	Extreme Precipitation	Waterlogging of flooding of construction compound and access.	High
	Average Temperature	Construction compound relatively insensitive to higher temperature.	Low
	Extreme Temperature	Drying out and cracking of construction compound periods of extreme temperature.	Moderate
	Wind	Increase in dust and windblown material.	Moderate
Materials	Average Precipitation	Material/spoil piles can dry out leading to dust Drying times can be reduced.	Moderate
	Drought	Material/spoil piles can dry out leading to dust Drying times can be reduced.	Moderate
	Extreme Precipitation	Run-off from material/spoil piles.	Moderate

Project Element	Climate Variable	Description of Sensitivity	Sensitivity
	Average Temperature	Combustion of flammable materials.	High
	Extreme Temperature	Increased risk of combustion of flammable materials.	High
	Wind	Increase in dust and windblown material.	Moderate
Drainage	Average Precipitation	Increase in pressure on drainage infrastructure.	Moderate
	Drought	Blocking of drains with debris in the absence of precipitation.	Moderate
	Extreme Precipitation	Overwhelming of drainage infrastructure.	High
	Average Temperature	Drainage infrastructure relatively insensitive to extreme temperature.	Low
	Extreme Temperature	Drainage infrastructure relatively insensitive to extreme temperature.	Low
	Wind	Drainage infrastructure relatively insensitive to increased wind speed.	Low
Plant and Equipment	Average Precipitation	Plant and equipment is relatively insensitive to reduced rainfall.	Low
	Drought	Plant and equipment is relatively insensitive to drought.	Low
	Extreme Precipitation	Plant may not be able to operate on waterlogged or flooded site.	Moderate
	Average Temperature	Machinery may overheat in high temperatures.	Moderate
	Extreme Temperature	Machinery may overheat in high temperatures.	Moderate
	Wind	Working at height is sensitive to increased wind speed.	High

Project Element	Climate Variable	Description of Sensitivity	Sensitivity
	Average Precipitation	Workforce is relatively insensitive to drier average conditions.	Low
Workforce	Drought	Workforce can suffer heatstroke during drought.	Moderate
	Extreme Precipitation	Workforce may not be able to work if the site is flooded.	Moderate
	Average Temperature	Workforce can suffer heatstroke.	Moderate
	Extreme Temperature	Workforce can suffer heatstroke.	Moderate
	Wind	Potential for injury.	Moderate
	Average Precipitation	Buildings unlikely to be affected by increase in average precipitation.	Low
Workplace Provisions	Drought	Buildings unlikely to be affected by drought.	Low
	Extreme Precipitation	Buildings may be vulnerable to flooding or deterioration in extreme precipitation.	Moderate
	Average Temperature	Buildings unlikely to be affected by increase in average temperature.	Low
	Extreme Temperature	Buildings may overheat in extreme temperature.	Moderate
	Wind	Building aspects may be vulnerable to destruction.	Moderate

During operation, the following Project assets are sensitive to the climate variables, as shown in the table below:

- Railway components - including railway line and overhead cables.

Operational Phase: Sensitivity to Weather and Climate

Project Element	Climate Variable	Description of Sensitivity	Sensitivity	Project Component
Railway Components (including track and overhead lines)	Average Precipitation	Reduction in average rainfall.	Drier average conditions may lead to more dust on the track.	Low
	Drought	Increase in drought conditions.	Prolonged dry periods may lead to drying out and cracking of earthworks and soils.	Moderate
	Extreme Rainfall	Little change in extreme rainfall.	Flooding of the track and potential for landslips.	High
	Average Temperature	Increase in average temperature.	Warmer average temperatures may cause damage to the tracks. An increase in solar radiation can also cause more rapid deterioration of materials and associated infrastructure such as signage.	Moderate
	Extreme Temperature	More heatwave events.	Extreme temperature may cause rail tracks to buckle or deform. The occurrence of track fires may become more common.	High
	Wind	Increase in wind speed.	More wind-blown debris on the track.	Moderate
	Sea Level	Increase in sea level.	Flooding of the track and potential for landslips.	High
Structures (including bridges,	Average precipitation Drought	Reduction in average rainfall Increase in drought conditions.	Prolonged dry periods may lead to drying out and cracking of materials, earthworks and soils, leading to instability.	Moderate

Project Element	Climate Variable	Description of Sensitivity	Sensitivity	Project Component
	Extreme Rainfall	Little change in extreme rainfall.	Flooding and scour of supporting structures.	High
	Average Temperature Extreme Temperature	Increase in average temperature More heatwave events.	High temperatures which may result in materials deterioration, affect thermal expansion joints and increase earth pressures.	High
	Wind	Increase in wind speed.	High winds and storms can affect the stability of above-ground infrastructure and hasten material degradation. High winds can also cause wind-driven rain infiltration into materials and surfaces which can increase maintenance costs and operational disruption.	High
	Sea Level	Increase in sea level.	Flooding and scour of supporting structures.	High
Existing Infrastructure (stations)	Average Precipitation Drought	Reduction in average rainfall Increase in drought conditions.	Prolonged dry periods may lead to drying out and cracking of materials, leading to instability.	Moderate
	Extreme Rainfall	Little change in extreme rainfall.	Flooding and scour of supporting structures.	High
	Average Temperature Extreme Temperature	Increase in average temperature More heatwave events.	Overheating in station buildings.	Moderate
	Wind	Increase in wind speed.	Station exterior at risk of damage from strong winds	Moderate
	Sea Level	Increase in sea level.	Flooding of station buildings	Moderate

Project Element	Climate Variable	Description of Sensitivity	Sensitivity	Project Component
Drainage	Average Precipitation Drought	Reduction in average rainfall Increase in drought conditions.	Drier average conditions may lead to more debris clogging up drainage infrastructure	Moderate
	Extreme Rainfall	Little change in extreme rainfall.	Drainage infrastructure overwhelmed.	Moderate
	Average Temperature Extreme Temperature	Increase in average temperature More heatwave events.	High temperatures may result in materials deterioration	Low
	Wind	Increase in wind speed.	Increase in debris on drainage infrastructure	Moderate
	Sea Level	Increase in sea level.	Overwhelming of drainage infrastructure	Moderate
Embankments and Planting	Average Precipitation Drought	Reduction in average rainfall Increase in drought conditions.	Drying out of soils, death of vegetation due to lack of moisture, increased maintenance requirements	Moderate
	Extreme Rainfall	Little change in extreme rainfall.	Waterlogging of soils, death of vegetation due to inundation	Moderate
	Average Temperature Extreme Temperature	Increase in average temperature More heatwave events.	Drying out of soils, death of vegetation due to scorching	Moderate
	Wind	Increase in wind speed.	Destruction of vegetation	Low
	Sea Level	Increase in sea level.	Waterlogging of soils, death of vegetation due to inundation	Moderate

Exposure of the project to climate variables during construction and operation is summarised in the table below based on the current baseline.

Construction Phase and Operational Phase: Exposure to Climate Variables

Climate Variable	Projected Change	Exposure Rating	
		Construction	Operation
Average precipitation	Reduction in average rainfall.	Low	Medium
Drought	Increase in drought conditions.	Low	Medium
Extreme rainfall	Little change in extreme rainfall.	Low	Low
Average temperature	Increase in average temperature.	Medium	High
Extreme temperature	More heatwave events.	Medium	High
Wind	Increase in wind speed.	Low	Medium
Sea level	Increase in sea level.	Low	Medium

The vulnerability of construction elements to climate variables during construction is summarised in the table below.

Construction Phase: Vulnerability of Construction Elements to Climate Variables

Project Element	Climate Variable	Sensitivity	Exposure	Vulnerability
Construction Compounds	Average Precipitation	Moderate	Low	Low
	Drought	Moderate	Low	Low
	Extreme Rainfall	High	Low	Low
	Average Temperature	Low	Medium	Low
	Extreme Temperature	Moderate	Medium	Medium
	Wind	Moderate	Low	Low
Materials	Average Precipitation	Moderate	Low	Low
	Drought	Moderate	Low	Low
	Extreme Precipitation	Moderate	Low	Low
	Average Temperature	High	Medium	Medium
	Extreme Temperature	High	Medium	Medium
	Wind	Moderate	Low	Low
Drainage	Average Precipitation	Moderate	Low	Low
	Drought	Moderate	Low	Low
	Extreme Precipitation	High	Low	Low

Project Element	Climate Variable	Sensitivity	Exposure	Vulnerability
	Average Temperature	Low	Medium	Low
	Extreme Temperature	Low	Medium	Low
	Wind	Low	Low	Low
Plant and Equipment	Average Precipitation	Low	Low	Low
	Drought	Low	Low	Low
	Extreme Rainfall	Moderate	Low	Low
	Average Temperature	Moderate	Medium	Medium
	Extreme Temperature	Moderate	Medium	Medium
	Wind	High	Low	Low
	Fog	High	Low	Low
Workforce	Average Precipitation	Low	Low	Low
	Drought	Moderate	Low	Low
	Extreme Precipitation	Moderate	Low	Low
	Average Temperature	Moderate	Medium	Medium
	Extreme Temperature	Moderate	Medium	Medium
	Wind	Moderate	Low	Low
Workplace Provisions	Average Precipitation	Low	Low	Low
	Drought	Low	Low	Low
	Extreme Precipitation	Moderate	Low	Low
	Average Temperature	Low	Medium	Low
	Extreme Temperature	Moderate	Medium	Medium
	Wind	Moderate	Low	Low

The vulnerability of Project elements to climate variables during operation is summarised in the table below.

Operational Phase: Vulnerability of Construction Elements to Climate Variables

Project Element	Climate Variable	Sensitivity	Exposure	Vulnerability
Railway Components (including track and overhead lines)	Average Precipitation	Low	Medium	Low
	Drought	Moderate	Medium	Medium
	Extreme Rainfall	High	Low	Low
	Average Temperature	Moderate	High	Medium
	Extreme Temperature	High	High	High
	Wind	Moderate	Medium	Medium
	Sea Level	High	Medium	Medium
Structures (including bridges, overpasses, tunnels, underpasses and viaducts)	Average Precipitation	Moderate	Medium	Medium
	Drought	Moderate	Medium	Medium
	Extreme Rainfall	High	Low	Low
	Average Temperature	High	High	High
	Extreme Temperature	High	High	High
	Wind	High	Medium	Medium
	Sea Level	High	Medium	Medium
Existing Infrastructure	Average Precipitation	Moderate	Medium	Medium
	Drought	Moderate	Medium	Medium
	Extreme Rainfall	Moderate	Low	Low
	Average Temperature	Moderate	High	Medium
	Extreme Temperature	Moderate	High	Medium
	Wind	Moderate	Medium	Medium
	Sea Level	Moderate	Medium	Medium
Drainage	Average Precipitation	Moderate	Medium	Medium
	Drought	Moderate	Medium	Medium
	Extreme Rainfall	Moderate	Low	Low
	Average Temperature	Low	High	Low

Project Element	Climate Variable	Sensitivity	Exposure	Vulnerability
	Extreme Temperature	Low	High	Low
	Wind	Moderate	Medium	Medium
	Sea Level	Moderate	Medium	Medium
Embankments and Planting	Average Precipitation	Moderate	Medium	Medium
	Drought	Moderate	Medium	Medium
	Extreme Precipitation	Moderate	Low	Low
	Average Temperature	Moderate	High	Medium
	Extreme Temperature	Moderate	High	Medium
	Wind	Low	Medium	Low
	Sea Level	Moderate	Medium	Medium

The results of the vulnerability assessment are that impacts associated with the following climate variables for the following Project elements have been assessed further are shown in the table below.

Construction Phase and Operational Phase: Vulnerability of project elements to Change in Climate Variables

Stage	Project Element	Variable
Construction	Construction Compound	Extreme Temperature
	Materials	Average Temperature Extreme Temperature
	Plant and Equipment	Average Temperature Extreme Temperature
	Workforce	Average Temperature Extreme Temperature
	Workplace Provisions	Extreme Temperature
Operation	Railway Components (including track and overhead lines)	Drought Average Temperature Extreme Temperature Wind Sea Level
	Structures (including bridges, overpasses, tunnels, underpasses and viaducts)	Average Precipitation Drought Average Temperature Extreme Temperature

Stage	Project Element	Variable
		Wind Sea Level
	Existing infrastructure	Average Precipitation Drought Average Temperature Extreme Temperature Wind Sea Level
	Drainage	Average Precipitation Drought Wind Sea Level
	Embankments and planting	Average Precipitation Drought Average Temperature Extreme Temperature Sea Level

Appendix T

ENVIRONMENTAL PERMITS (CHAPTER 19: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN)

Table T-1 – Environmental Permits

Topic	Permit Title	Awarding authority	Reason for permit	Permit limits
Construction				
Air Quality	Environmental Permit and License (Permit Subject: Air Emission)	Ministry of Environment and Urbanization	To cover the following activities: ▪ Use of borrow pits; ▪ Use of crushing-screening-washing facilities; and ▪ Use of ready-mixed concrete facilities.	Borrow pits using blasting The pits with a production capacity of 200 tons / day and above and where mines classified as Group I a and b, Group II (including limestone), Group IV, Group V in the Mining Law dated 04.06.1985 and numbered 3213 are extracted The facilities with a production capacity of 200 tons / day and above and that are used for crushing, grinding and sieving slag, debris and mines classified as Group I a and b, Group II (including limestone), Group IV, Group V in the Mining Law
Noise and Vibration	Environmental Permit and License (Permit Subject: Ambient Noise)	Ministry of Environment and Urbanization	To cover the following activities: ▪ Using of borrow pits; ▪ Use of crushing-screening-washing facilities; ▪ Tunnel blasting; and ▪ Use of ready-mixed concrete facilities.	Borrow pits using blasting The pits with a production capacity of 200 tons / day and above and where mines classified as Group I a and b, Group II (including limestone), Group IV, Group V in the Mining Law dated 04.06.1985 and numbered 3213 are extracted The facilities with a production capacity of 200 tons / day and above and that are used for crushing, grinding and sieving slag, debris and mines classified as Group I a and b, Group II (including limestone), Group IV, Group V in the Mining Law
Agricultural Lands	Permit on Change in allocation purpose	The head of the Provincial Commission for Pastures	Using of pasture lands.	As per Article 14 of Pasture Law No. 4342, in relation with non-movables of pasture quality, an application will be performed to the head of the Provincial Commission for Pastures in compliance with Article 14, Clause 1, paragraph “c” of the Pasture Law for a request of change in the allocation purpose.
Materials	Operating permit	Directorate General of Mining and Petroleum Affairs	To cover the following activities: ▪ Using of borrow pits; ▪ Using of crushing-screening-washing facilities; and ▪ Using of ready-mixed concrete facilities.	In case of using of mines defined in the Article 2 of Mining Law dated 04.06.1985 and numbered 3213. Additionally, in case of the use of borrow pits of state highways, the permits will be received from the State Highways Regional Administration.
Wastewater	Wastewater connecting permit	Relevant Management of wastewater infrastructure facilities	If the project construction site is located in municipal adjacent area, a permit will be required for the connection to the nearest sewage pipe.	If the project construction compound is located in a municipal area and wastewater from the Project construction site is being discharged to sewage network.
Waste	Temporary Storage Permit	Relevant Provincial Directorate of Environment and Urbanization	Production of hazardous wastes.	Production of 1,000 kilograms or more of hazardous wastes per month. If hazardous waste production is less than 1,000 kilograms per month, facilities should still apply to the Ministry to obtain an exemption.
Ecology	Forest Permits	Ministry of Agriculture and Forestry	To erect and install facilities (including temporary ones) in forested areas.	Use of forest areas is subject to forest permits that will be provided in compliance with the governing regulation of Articles 17/3 and 18 of the Forestry Law No. 683 (1956 as amended in 2016).
Archaeological Excavations	Applications for archaeological excavations and surveys	Director General for Culture and Tourism	To undertake archaeological excavations and surveys	Applications for survey need to include a clear photocopy of a map indicating the area to be surveyed

Appendix U

ENVIRONMENTAL STANDARDS (CHAPTER 19: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN)

STANDARDS OF ENVIRONMENTAL PERFORMANCE

The Project will comply with all standards as defined in national legislation, transport strategies and EU substantive environmental standards. The requirements that the Project will comply with include the following;

- EBRD's Environmental and Social Policy (ESP) and Performance Requirements (PRs) 2014; and
- Relevant international conventions and protocols relating to environmental and social issues, as transposed into national legislation.

The Project activities will further comply with norm and standards recommended by specialised international organisations affiliated to the United Nations. These include;

- The World Bank, including the IFC and its General Environmental, Health and Safety guidelines covering topics not addressed by the Lenders' policies eg, Noise;
- The World Health Organisation (WHO); and
- The International Labour Organization (ILO), including those ratified by the Turkish Government and specifically mentioned in the core ILO conventions.

Listed below are regulations specific to environmental aspects (Air Quality, Noise and Surface Water) which will need consideration as part of the construction and operational environmental and social management plans. These are informed by EU and national legislation, where the host country (Turkey) regulations differ from EU substantive environmental standards, the Project will be expected to meet the most stringent of these.

Air Quality

The Air Quality Directive 2008/50/EC sets limit values for the concentration of pollutants in air for the protection of human health, vegetation and ecosystems.

The Turkish air quality standards considered for this Project, are in all cases equal to the equivalent EU standards, with the exception of hourly mean NO2 which is less stringent than the equivalent EU standard. Construction and Operational activities should be undertaken in line with EU Air Quality standards as per PR3 of EBRD's Environmental and Social Policy (2014) as these represent the worst case or are equivalent to Turkish air quality standards.

Table U-1 - Air Quality Standards

WHO Guideline				EU Air Quality Standards			
Short-term Limit ($\mu g/m^3$)		**Long-term Limit ($\mu g/m^3$)**		**Short-term Limit ($\mu g/m^3$)**		**Long-term Limit ($\mu g/m^3$)**	
Nitrogen Dioxide (NO_2)							
200	Hourly (1-hour) mean	40	Annual mean	200	Hourly (1-hour) mean (no more than 18	40	Annual mean

WHO Guideline				EU Air Quality Standards			
					exceedances per year)		
Particulates Less than 10 Micrometres in Diameter (PM_{10})							
50	Daily (24-hour) mean	20	Annual mean	50	Daily (24-hour) mean, not to be exceeded more than 35 times a calendar year	40	Annual mean

Noise and Vibration

Directive 2000/14/EC of the European Parliament and the Council of the European Union should be followed in respect to outdoor equipment noise. The Directive:

- Presents noise limits in the form of guaranteed sound power levels for equipment which should not be exceeded during the construction phase of the Project;
- Includes guidance on the conformity assessment procedures which the equipment should pass before placing into the market and procured for the Project.

BS5228:2009, A1:2014, titled 'Code of Practice for Noise and Vibration Control on Construction and Open Sites' provides guidance that should be used during the Construction of the Project. The note advises to limit the noise levels between 7:00 – 19:00 hours to 70dB(A) in rural, suburban and urban areas away from main roads and to 75dB(A) in urban areas near main roads and heavy industrial areas. This noise limit is in accordance with Annex VII of the Turkish Regulations on the Assessment and Management of Environment Noise (2010).

The international guidelines provide in the World Bank Group Environmental, Health and Safety Guidelines: Noise Management (2007) should be used when monitoring environmental noise during operation of the Project. The guidelines state that the noise impact should not exceed the levels presented in Table below, or result in a noise level not greater than background levels (Leq,T) plus 3dB at the nearest receptor. These guideline levels should be applied as they are more stringent than those in the Turkish Regulation on the Assessment and Management of Environmental Noise (2010).

Table U-2 - World Bank Group Noise Level Guidelines

Receptor	Criteria $L_{Aeq,1hr}$[325]
Residential, Institutional, Educational	55dB L_{day} (07:00 – 22:00); 45dB L_{night} (22:00 – 07:00)

In the absence of equivalent guidance in Turkey, BS 6472-1:2008 provides guidance on predicting human response to structural vibration in buildings and describes how to determine the frequency weighted vibration dose value (VDV). The vibration dose value can be used to estimate the probability of adverse comment which might be expected from human beings.

Adverse comment about building vibration is likely when the vibration levels to which occupants are exposed are only slightly above thresholds of perception. Table below reproduces Table 1 from BS6472-1:2008 and describes the VDV ranges which may result in adverse comment by those who experience it.

Table U-3 - Vibration Dose Value Ranges Which Might Result in Various Probabilities of Adverse Comment Within Residential Buildings

Place and Time	Low Probability of Adverse Comment ($ms^{-1.75}$)	Adverse Comment Possible ($ms^{-1.75}$)	Adverse Comment Probable ($ms^{-1.75}$)
Residential buildings 16h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8hr night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

BS5228 references BS7385-2 ‘Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration’. The criteria (shown in Table U-4) relates to the thresholds of cosmetic damage due to vibration. BS 7385-2 states that the probability of damage from transient vibration tends towards zero at 12.5 mm/s peak component particle velocity. For continuous vibration, such as from vibratory rollers or tunnel boring, the threshold is around half this value.

[325] The A-weighted, equivalent continuous sound level in decibels measured over a 1hr period.

Table U-4 - Transient Vibration Guide Values for Cosmetic Damage

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Note 1: Values referred to are at the base of the building. Note 2: For un-reinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.		

19.6.4. The Guide to Evaluation of Human Exposure to Vibration in Buildings: Blast-induced vibration (BS6472-2:2008)326 relates to the perceived effects of vibration arising as a result of blasting. The application of the standard is primarily for mineral extraction activities, however, it can be extended to civil engineering works. Table U-5 reproduces Table 1 from BS6472-2 and describes the maximum satisfactory magnitudes for vibration as a result of blasting, measured outside buildings with respect to human response.

Table U-5 - Maximum satisfactory Magnitudes of Vibration with respect to Human response (for up to 3 Blast Vibration Events per Day)

Place and Time	Time	Satisfactory magnitude[A] PPV mms^{-1}
Residential	Day[D]	6.0 to 10.0[C]
	Night[D]	2.0
	Other Times[d]	4.5

[326] BSI (2008). BS6472-1. Guide to Evaluation of Human Exposure to Vibration in Buildings: Blast-induced vibration.

Place and Time	Time	Satisfactory magnitude[A] PPV mms^{-1}
Offices[B]	Any time	14.0
Workshops[B]	Any time	14.0

NOTE 1 This table recommends magnitudes of vibration below which the probability of adverse comment is low (noise caused by any structural vibration is not considered).

NOTE 2 Doubling the suggested vibration magnitudes could result in adverse comment and this will increase significantly if the magnitudes are quadrupled.

NOTE 3 For more than three occurrences of vibrations per day see the further multiplication factor in 5.2.

A) The satisfactory magnitudes are the same for the working day and the rest of the day unless stated otherwise.

B) Critical working areas where delicate tasks impose more stringent criteria than human comfort are outside the scope of this standard.

C) Within residential properties people exhibit a wide variation of tolerance to vibration. Specific values are dependent upon social and cultural factors, psychological attitudes and the expected degree of intrusion. In practice the lower satisfactory magnitude should be used with the higher magnitude being justified on a case-by-case basis.

D) For the purpose of blasting, daytime is considered to be 08h00 to 18h00 Monday to Friday and 08h00 to 13h00 Saturday. Routine blasting would not normally be considered on Sundays or Public Holidays. Other times cover the period outside of the working day but exclude night-time, which is defined as 23h00 to 07h00.

Surface water

19.6.5. The Regulation on Control of Water Pollution (2004) – as amended in 2010, 2016, 2018 and 2020 should be used when undertaking water quality monitoring. The Regulation establishes standards / limits relating to pollution discharge into waterbodies, details the permitting system for discharge activities, and classifies water quality of waterbodies (rivers, lakes and dam reservoirs) in Turkey into 4 classifications from I to IV (Class I: High quality; Class II: Lightly polluted; Class III: Polluted; Class IV: Highly polluted). The parameters of these water quality classes are set out in Table U-6 below.

Table U-6 – Quality Criteria of In-land Water Resources with Respect to Their Classification

	Water Quality Classes			
Water Quality Parameters	I	II	III	IV
Physical and inorganic-chemical parameters:				
1. Heat (oC)	25	25	30	>30
2. pH	6.5-8.5	6.5-8.5	6.0-9.0	other than 6.0-9.0
3. Dissolved oxygen (mg O2/l)a	8	5	3	<3
4. Oxygen saturation (%)a	90	70	40	<40
5. Chloride ion (mg Cl-/l)	25	200	400b	>400
6. Sulphate ion (mg SO4/l)	200	200	400	>400
7. Ammonium nitrogen (mg NH4-N/l)	0.2c	Lc	2c	>2
8. Nitrate nitrogen (mg NO2-N/l)	0.002	0.0 1	0.05	>0.05
9. Nitrate nitrogen (mg NO3-N/l)	5	10	20	>20
10. Total phosphor (mg PO4/l)	0.02	0.16	0.65	>0.65
11. Total dissolved materials (mg/l)	500	1500	5000	5000
12. Color (Pt-Co unit)	5	50	300	>300
13. Sodium (mg ~Na+/l)	125	125	250	>250
Organic parameters:				
I. COR (mg/l)	25	50	70	>70
2. BOR (mg/l)	4	8	20	>20
3. Organic carbon (mg/l)	5	8	12	>l2
4. Total Kjeldahl nitrogen (mg/l)	0.5	1.5	5	>5
5. Emulsified oil and grease (mg/l)	0.02	0.3	0.5	>0.5
6. Methylene blue active materials (mg/l)	0.05	0.2	1	>1.5
7. Phenolic materials (volatile) (mg/l)	0.002	0.0 1	0.1	>0.1
8. Mineral oil and derivatives (mg/l)	0.02	0.1	0.5	>0.5
9. Total pesticides (mg/l)	0.00 1	0.0 1	0.1	>0. 1
Inorganic pollution parameters:				
1. Mercury (ug Hg/l)	0.1	0.5	2	>2

	Water Quality Classes			
2. Cadmium (ug Cd/l)	3	5	10	>l0
3. Lead (ug Pb/l)	10	20	50	>50
4. Arsenic (ug As/l)	20	50	100	>100
5. Copper (ug Cu/l)	20	50	200	>200
6. Chromium (Total) (ug Cr/l)	20	50	200	>200
7. Chromium (ug CR+6),	negligible	20	50	>50
8. Cobalt (ug Co/l)	10	20	200	>200
9. Nickel (ug Ni/l)	20	50	200	>200
10. Zinc (ug Zn/l)	200	500	2000	>2000
1 1. Cyanide (ug CN/l)	10	50	100	>l00
12. Fluoride (ug F-/l)	1000	1500	2000	>2000
13. Free chlorine (ug Cl2/l)	10	10	50	>50
14. Total Sulphur (ug S2/l)	2	2	10	>10
15. Iron (ug Fe/l)	300	1000	5000	>5000
16. Manganese (ug Mn/l)	100	500	3000	>3000
17. Boron (ug B/l)	1000e	1000e	1000e	>l000
18. Selenium (ug Se/l)	10	10	20	>20
19. Barium (ug Ba/l)	1000	2000	2000	>2000
20. Aluminium (ug AI/l)	0.3	0.3	1	>1
21. Radioactivity (pCi/l)				
alfa-activity	1	10	10	>l0
beta-activity	10	100	100	>l00
Bacteriological parameters:				
l. Fecal coliform (EMSI100ml)	10	200	2000	>2000
2. Total coliform (EMS/lOO ml)	100	20000	l00000	> 100000

(a) Meeting one of the concentration or saturation rate is sufficient

(b) For irrigation of plants vulnerable against chloride this concentration limit should be lowered

(c) Depending on pH value, free ammonium nitrogen concentration should not exceed 0.02 mg NM_3-M/l

(d) The criteria in this group give total concentrations of chemical derivatives constituting the parameters

(e) For irrigation of plants vulnerable against boron, reducing the criterion to 300 mg/l may be necessary

Appendix V

MANAGEMENT OF CHANGE PROCEDURE (CHAPTER 19: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN)

MANAGEMENT OF CHANGE PROCEDURE

Introduction

This Management of Change Procedure (MCP) sets out how the potential EHSS implications of design changes would be assessed. The assessment of the design change would aim to ensure that adequate mitigation is adopted to minimise and avoid effects where any deviations to the Project, as described in the ESIA, are proposed. This procedure also covers associated infrastructure not defined which could be located beyond the Project area. Such infrastructure could include the following: access tracks, construction compounds, workers accommodation, waste management facilities and changes to the public highway or accesses.

This MCP should be read in conjunction with the Environmental and Social Management Plan (ESMP) for the Project, where the roles and responsibilities of AYGM, the Project Implementation Unity (PIU), the Supervision Consultant, and the Contractor are set out in Section 19.3. Contractors will prepare their own management of change procedure in compliance with this procedure and give required training to its staff.

Potential changes can be triggered at either the design stage, or during construction, and can be initiated by various stakeholders (AYGM, PIU, Supervision Consultant, Lenders, Community or the Contractor). The changes by Contractors or the PIU could be prompted by the application of the environmental and social design principles that are set out in the ESMP. They could include:

- Basic design refinement, after disclosure of the ESIA, due to detailed topographic or geotechnical information, or Lenders' requirements;
- Detailed design development submitted by the design team of the Contractor in advance of the construction activities and approved by AYGM/PIU;
- Results of further field surveys, investigations, and monitoring;
- Comments or concerns submitted by stakeholders, including the public;
- Changes in regulations or comments by regulatory bodies; and
- Unexpected Issues arising during construction.

The Contractor would define the technical changes to the design that are proposed and determine the need to conduct EHSS studies to inform the potential implications of changes to the design. The MCP recognises that there could be differing degrees of change, and the need and scope of environmental and social investigation would need to be appropriate for the proposed change. Consequently, three categories of change have been developed, which comprise:

CATEGORY 1

A Project design or activity change that does not result in any changes to, or impacts on, communities or the natural environment, and does not cause non-compliance with respect to national legislation and project requirements as a result of the design change. Any potential impacts would be routinely controlled through the existing measures outlined in the ESMP. Subject to technical evaluation, the change can be accepted without the need for further EHSS studies. Management of change process form in Annex-1 will be filled and submitted to Supervision Consultant for review and approval and submitted to the PIU for information.

CATEGORY 2

A Project design or activity change that could lead to EHSS changes, but which are unlikely to result in significant effects. Such effects may or may not have been covered by the ESIA or by mitigation measures outlined in the ESMP. These design changes would not be in sensitive locations (i.e. within an IBA or within proximity of settlements (within 150m)) and are unlikely to result in potential non-compliance with Project EHSS requirements (see Chapter 3 of the Contractor Management Plan). However, an EHSS study would be required to demonstrate the potential impacts of the change and to confirm that measures are either already in place in the ESMP, can be controlled by good international practice or measures can be extended or introduced to fully control and/or mitigate the potential impacts. The PIU would undertake a review and approve the scope and outcome of these Category 2 EHSS studies prior to any design changes being implemented. This change will come through either the Contractor or Supervision Consultant, in accordance with the above listed change principles, and the Management of Change Process Form given in the Annex-1 will be prepared including the EHSS studies and submitted for the approval of PIU.

CATEGORY 3

This applies to a project design or activity change that could result in potentially significant effect, that was not included in the ESIA and is not covered by the ESMP. A Category 3 change would also apply to any changes outside the ESIA study area, within an IBA, or within proximity of settlements (within 150m). Category 3 changes will require approval of both the scope and outcome of EHSS studies from both AYGM/PIU and the Lenders. These EHSS studies will need to demonstrate compliance with the Project EHSS requirements. In some circumstances, the assessment may need to be undertaken in consultation with stakeholders and communities and may require full public disclosure, prior to confirmation of no objection by the Lenders, and will likely lead to changes to the Contractors ESMP. This change will come through either the Contractor or Supervision Consultant in accordance with the above listed change principles, the Management of Change Process Form given in the Annex-1 will be prepared including the EHSS studies/assessments and submitted the PIU for approval and submitted to the Lenders for confirmation that they have no objection. Work can progress once both approval from the PIU and no objection from the Lenders is received.

Procedure

The general MCP procedure is described in the following eight steps:

Note – in case the change is initiated by AYGM, PIU will undertake the below steps preparing the screening and supplementary documentation and undertaking any disclosure and stakeholder engagement required.

Step 1 - Notification of Design Change and Screening by Contractor

The Contractor will notify the Supervision Consultant of the need to change the design or clarify the details of associated infrastructure being developed outside of the Project area. In doing so, the Contractor will present details of the proposed change, the justification for the change, any alternatives considered and indicate their preliminary evaluation of the EHSS category of the change.

The Supervision Consultant shall review and approve the Annex-1 screening conducted by the Contractor to provide a preliminary opinion for proposed design changes in order to evaluate the EHSS categorisation of the design change.

The Supervision Consultant shall register and track all proposed changes to the design (irrespective of the entity who initiates the change), or the design of associated infrastructure that fall outside the Project area, in an MCP log, for periodic review by PIU/the Lenders. The MCP log shall be used to document all design change decisions.

Step 2 – Screening Review by Supervision Consultant

The Supervision Consultant shall then examine the Management of Change Process Form and documentation provided by the Contractor (e.g. drawings, technical notes, or Feasibility Studies) for all Category 2 and 3 design changes to understand the features and location of the proposed change in order to confirm the categorisation of the proposed design change. If the Supervision Consultant agrees to the change being a Category 1 change, it will inform the Contractor and no further work is necessary. PIU will be informed about all category changes in the monthly reports. For all Category 2 and 3 changes, the Supervision Consultant will inform the Contractor of the need to provide a scope of works in line with Step 3 below.

In addition, for each Category 2 and 3 design change, the Supervision Consultant shall assess and monitor whether the Contractor has evaluated a sufficient number of alternative designs and selected the most appropriate option taking into account inter alia the potential EHSS impacts.

Step 3 - Scoping of Environmental, Health and Safety and Social Studies (EHSS) for Category 2 and 3 Changes

The Contractor is responsible for the procurement and funding of the EHSS study necessary for Category 2 and 3 design changes (unless they are proposed by AYGM / PIU). The Contractor shall establish:

- the scope and level of detail of the necessary EHSS Study;
- the scope of any necessary site surveys; and
- the technical studies, assessments and reporting formats needed.

The proposed scope of the EHSS study will be based on the methods used in the Project ESIA, where applicable. The PIU shall coordinate with the Contractor and Supervision Consultant to ensure that these needs are addressed. The PIU would approve the scope of an EHSS study for a Category 2 change via the review and monitoring undertaken by the Supervision Consultant.

For Category 3 changes, the Supervision Consultant will review, monitor and inform PIU and PIUshall report to the Lenders to inform them of: the proposed change; the result of the EHSS screening; and to gain approval for the proposed scope of the EHSS study. The EHSS study proposed by the Contractor must comply with the Project EHSS requirements. The Lenders must approve the scope of all Category 3 EHSS studies. At this scoping stage for Category 3 changes, the need for stakeholder engagement and public disclose of the final EHSS study is also to be determined by the PIU and approved by the Lenders.

The Supervision Consultant shall review the Contractors proposals with respect to the:

- Scope and level of detail of the necessary EHSS Study;
- Scope of the site surveys;

- Technical studies, assessments and reporting formats; and
- Proposals for stakeholder consultation and public disclosure (where relevant).

The PIU shall review the proposed scope of EHSS work based on the recommendation from the Supervision Consultant to ensure it is compliant with the Project EHSS requirement

For Category 3 changes, the PIU shall report to the Lenders the proposed design changes, the result of the EHSS screening as per Annex-1 Management of Change Process Form (MCPF), the proposed scope of the EHSS study and the strategy for stakeholder consultation.

PIU shall inform the Contractor of the outcome of this review.

Step 4 – Environmental, Health and Safety, and Social Studies for Category 2 and 3

The Contractor procures, funds, and undertakes the approved EHSS study for design changes proposed by the Contractor. AYGM would fund the EHSS study if the changes are proposed by AYGM/PIU.

For Category 3 changes, the Contractor undertakes the agreed stakeholder consultation. The Supervision Consultant monitors the stakeholder consultation process and the EHSS study.

Where public disclosure and consultation of the EHSS study is needed, PIU shall support the Contractor with any public disclosure and consultation requirements of any EHSS studies by organising any public meetings and posting details of the disclosure on the Project website. Public disclosure and consultation only occurs after Step 5 which is the review and approval of the EHSS study. Feedback from disclosure and consultation shall be accounted for in the final design of the change.

Step 5 - Review and Approval

For Category 2 design changes, the EHSS study report(s) shall be submitted for the approval or rejection of the PIU only. For Category 3 changes the PIU shall provide the EHSS study report(s) for the Lender's review and approval. The Lender's must approve all Category 3 design changes.

The review and approval of Category 3 changes must demonstrate compliance with the Project EHSS requirements. The Supervision Consultant will review, monitor the EHSS studies carried out by the Contractor and give feedback to the PIU.

The PIU shall inform the Contractor about the final outcome of the review of the design changes and the results of any EHSS study reviews making clear the details of any additional work needed to the EHSS studies. Changes and updates will be made to the ESMP, or CESMP if appropriate, as required for both Category 2 and 3 changes – see Step 7.

The Supervision Consultant shall review the Category 2 and 3 EHSS study report(s) provided by the Contractor and verify the following for the final approval of PIU;

- Robustness of the baseline description;
- Relevance and adequacy of the impact assessment;
- Effectiveness of the proposed mitigation strategy; and
- Identification of any changes to the ESMP.

Once any Category 3 EHSS studies are finalised and approved, the PIU shall support the Contractor with any public disclosure requirements of any EHSS studies by organising any public meetings and posting details of the disclosure on the Project website.

Step 6 - Local EIA and Permits

The Supervision Consultant shall, for all approved design changes, carry out a review of existing permits to determine whether these could be affected and whether revisions to the national EIA are required. Supervision Consultant would be responsible for notifying the appropriate regulators of all material design changes where these could affect the terms of permits already issued, and the preparation of any revised permit applications or revisions to the national EIA. The Contractor will then be responsible for implementing and complying with the requirements of the local permits.

Step 7 - Addenda to ESMP

If an approved design change requires environmental and social measures which are not covered by the existing ESMP, the Contractor shall prepare an addendum to the ESMP, or CESMP if appropriate, and specific management plans to address any new mitigation measures. The addenda, together with the document it is an addenda to, shall be submitted to the Lenders and disclosed on the Project website.

Step 8 - Addenda to Resettlement Action Plans

For each approved design change, the PIU shall conduct the land surveys required and the necessary consultations to update the Resettlement Action Plans (RAP) for the area affected by the proposed change in design. The PIU shall use the result of the RAP investigations to minimise impacts on livelihoods and implement the required actions with the Contractor.

The PIU shall submit the addenda to the RAP to the Lenders before payment of compensation and actual land take. The RAP shall be disclosed on the Project website and compensations paid in order that the land take can be formalised.

ANNEX-1

AYGM Altyapı Yatırımları Genel Müdürlüğü	*MANAGEMENT OF CHANGE PROCESS FORM*	Record No: Page 1 of 4

MANAGEMENT OF CHANGE PROCESS FORM	
Section A. This section of the form will be filled-out by the Facilitator of the Change	
Facilitator of the Proposed Change (s):	
Date:	
Location of the proposed Change(s):	
References to Relevant Design Documentation/ Drawings:	
Summary of the Proposed Change (s):	
Please specify the change content:	☐ Route/site facility change ☐ Engineering/Design Development ☐ Change in Legislation ☐ Change in Authority Decision ☐ Change in new E&S data including community safety ☐ Change of Construction/Operation Execution strategy ☐ Change of Management Strategy ☐ Stakeholder influence
ROUTE/SITE FACILITY CHANGE	
Please provide details of the route/site facility change *Note: Please refer to the ESIA Report and E&S documentation of the Project and if the change is Category 2 or 3, then prepare a detailed EHSS study and submit to*	

the approval of DGII and the Lenders.	
ENGINEERING/DESIGN DEVELOPMENT CHANGE	**Please specify the new E&S aspects with the below given questions?**
ATMOSPHERIC EMISSIONS	
Will there be any associated atmospheric emissions? If so, which contaminants will be emitted? What volumes or concentrations of these contaminants will be emitted?	
How will these contaminants be managed to reduce the environmental impact?	
How will the emission of these contaminants affect AYGM's compliance with national and/or international legislation and policy commitments?	
WASTEWATER DISCHARGES	
Will there be any associated wastewater discharges? If so, what contaminants will be discharged? What volumes or concentrations of these contaminants will be discharged?	
How will this affect AYGM's compliance with national/ international legislation and policy commitments?	
WASTE GENERATION	
Will any wastes be generated? If so, what types of waste will be	

generated? What quantities of these wastes will be generated?	
How will these wastes be managed and finally disposed?	
NOISE	
Will the proposed change be expected to create any additional noise impact? If so, what will be the level of this additional noise?	
How will the noise impact be mitigated if it is likely to exceed Project Standards?	
SOIL	
Will the proposed change be expected to create any additional impact to soil? If so, what will be the level of this additional impact?	
How will the soil impact be mitigated if it is likely to exceed Project Standards?	
ENVIRONMENTAL AND CULTURAL SENSITIVE AREAS	
Is a critical habitat (CH) or archaeological site (ARC) identified within the vicinity of the proposed change?	
If yes, has a specialist desktop (ecological or archaeological) review been completed to identify risks to the CH?	
If yes, will the proposed change create any impact on environmental sensitive areas? If so, what are those areas and what recommendations will be required?	

How will the impact on these areas be mitigated? As per national or international standards?	
USE OF NATURAL RESOURCES	
Will the proposed change create any increase in energy, water, raw material, fuel consumptions or additional land use? If so, what type and amount of increase is expected?	
Will there be any additional permit/legal requirements?	
ENVIRONMENTAL MONITORING	
Will there be any environmental monitoring/reporting requirements?	
If so, what will be these monitoring/reporting requirements and how will they be conducted?	
How often will these monitoring/reporting requirements need to be conducted?	
MAINTENANCE	
Will any air emissions, wastewater discharges or wastes be generated during maintenance activities associated with the proposed change?	
If so, what contaminants will be generated? What quantities of these contaminants will be generated?	
How will these contaminants be managed to reduce the environmental impact? Are these management strategies in line with	

the existing national and international requirements?	
HAZARDOUS MATERIALS	
Will any new hazardous materials be used? If so, what types and quantities will be used? Does the MSDS of the new hazardous material fit for the legal requirements?	
How will these materials be stored and handled?	
Have Material Safety Data Sheets (MSDSs) been obtained, retained and communicated to all relevant personnel?	
How will these contaminants be managed to reduce the environmental impact?	
SENSITIVE RECEPTORS	
Will there be any additional or new sensitive receptors in the vicinity?	
POLITICS AND GOVERNANCE	
Will any additional or new authority approval or permit be required?	
SETTLEMENT PROFILE	
Are any settlements or houses nearby?	
INFRASTRUCTURE FACILITIES	
Will any additional or new infrastructure be crossed (roads, etc.)?	
TRANSPORTATION AND TRAFFIC	

Will there be any additional or new impact on existing, local traffic?	
ECONOMIC CONDITIONS	
Will economic conditions of the area be affected?	
LAND	
Will additional or new land be required?	
LAND USE	
If additional or new land is required, is it used as agricultural, pasture or forest?	
EMPLOYMENT AND LIVELIHOODS	
Will there be positive effects in terms of employment or procurement?	
CHANGE IN LEGISLATION	**Please specify the change details.**
CHANGE IN AUTHORITY PROVISION	**Please specify the change details.**
CHANGE IN NEW E&S DATA	**Please specify the change details.**
CHANGE OF CONSTRUCTION/OPERATION EXECUTION STRATEGY	**Please specify the change details.**

CHANGE OF MANAGEMENT STRATEGY	**Please specify the change details.**
STAKEHOLDER INFLUENCE	**Please specify the change details.**
Section B. This part will be filled by following disciplines for specific evaluation of MCP data	
COMMENTS OF SPECIALISTS	
Environmental Discipline	
Social Discipline	
HS and Railway Safety Discipline	
Land & Permits Discipline	
Project Manager	

Please state the final decision and category of the change based on the below headings:

☐ Category 1

☐ Category 2

☐ Category 3

☐ **No action is required. Change can be implemented.**
☐ **Additional permit is required.**
☐ **Environmental and Social Assessment is required.**
☐ **Public Consultation is required.**
☐ **Project Description File is required by State Authorities.**
☐ **EIA/ESIA Process is required by State Authorities and Lenders.**
☐ **Change can be implemented provided that:**

Note: After filling-out the form, please hand over the EMCP data to the Facilitator of the Change for the given decision to be communicated with the related stakeholders, in order to proceed to the approval/no objection.

Appendix W

KEY PERFORMANCE INDICATORS (CHAPTER 19: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN)

KEY PERFORMANCE INDICATORS

Indicator	Responsibility	Frequency of Monitoring/ Reporting	Type	Target
Oversight and Assurance				
Percentage and number of audits / inspections completed vs planned by AYGM/PIU	AYGM/PIU	Quarterly	KPI	100%
Percentage and number of audits / inspections completed vs. planned by Contractor/Supervision Consultant	Supervision Consultant/ Contractor	Quarterly	KPI	100%
Percentage and number of overdue AYGM EHSS Issues Register items	AYGM/PIU	Monthly	KPI	0
Results of formal EHSS inspections	AYGM/PIU/ Supervision Consultant/ Contractor	Quarterly	Measure	
Non-conformance Reporting (NCR)				
Percentage and total number of NCRs raised, categorised by severity for each of the following categories; ▪ Air quality, ▪ Noise and vibration, ▪ Social concerns, ▪ Soil & erosion control, ▪ Habitats, and ▪ Other.	Supervision Consultant/ Contractor	Monthly	Measure	
Number of open NCRs versus the number of closed NCRs	Supervision Consultant/ Contractor	Monthly	Measure	
NCR findings responded to within agreed timeframes	Supervision Consultant/ Contractor	Monthly	KPI	100%
Number of repeated non-conformances	Supervision Consultant/ Contractor	Monthly	KPI	0
EHSS Monitoring				
Percentage of EHSS monitoring undertaken and reported versus planned	Supervision Consultant/ Contractor	Monthly	KPI	100%
Proportion of emissions and discharge monitoring results in accordance with the Project EHSS standards	Supervision Consultant/ Contractor	Monthly	KPI	100%

Indicator	Responsibility	Frequency of Monitoring/ Reporting	Type	Target
Amounts of seeds collected	Contractor	Monthly	Measure	
Number of species collected for translocation	Contractor	Monthly	Measure	
Training				
EHSS training delivered in accordance with planned training activities	AYGM/PIU, Supervision Consultant, Contractor	Monthly	KPI	95%
Percentage of construction workers that have undertaken a construction site induction before commencing work	AYGM/PIU, Supervision Consultant, Contractor	Monthly	KPI	100%
Health and Safety induction and required personal protective equipment (PPE) provided for all new construction workers	Contractor	Monthly	KPI	100%
Toolbox talks provided to all construction workers as determined by the construction activities taking place.	Contractor	Monthly	Measure	
Results of education programmes in increasing awareness and minimising negative effects.	AYGM/PIU, Supervision Consultant, Contractor	Monthly	Measure	
Waste Management				
Amount and Percentage of waste recycled/reused versus the Amount and Percentage of waste landfilled	Contractor	Monthly	Measure	
Total amount of solid waste generated	Contractor	Monthly	Measure	
Percentage of Waste and Materials Storage Areas compliant with the ESMP	Contractor	Monthly	KPI	100%
Amount and Percentage of hazardous waste generated versus. sent to disposal	Contractor	Monthly	Measure	
Amount and Percentage Waste generated as a result of oil/diesel/hazardous chemicals spills or cross-contamination of waste due to poor segregation versus Percentage of the contaminated waste disposed	Contractor	Monthly	Measure	
Cultural Heritage				
Percentage of chance finds reported per project requirements	Supervision Consultant and Contractor	Monthly	KPI	100%
Social performance				

Indicator	Responsibility	Frequency of Monitoring/ Reporting	Type	Target
Engagement: number of stakeholder meetings/community awareness sessions	Supervision Consultant and Contractor	Monthly	Measure	
Value of materials and services purchased in country	Supervision Consultant and Contractor	Monthly	Measure	
Percentage of complaints resolved in less than 30 days	Supervision Consultant and Contractor	Monthly	KPI	90%
Compensation paid as a result of project impacts other than land acquisition compensation	Supervision Consultant and Contractor	Monthly	Measure	
No access to land prior to EHSS assessment approval, and completion of Land Entry Protocol	Supervision Consultant and Contractor	Monthly	KPI	0
Number of complaints received related to each of the following construction activities; ▪ Fugitive dust, ▪ Construction noise; ▪ Construction vibration; and ▪ Visual amenity.	Contractor	Monthly	Measure	n/a
EHSS Incident notification and reporting				
Percentage and number of EHSS incidents categorised by severity	Contractor	Monthly	Measure	
Number of reported accidents, incidents and near misses	Contractor	Monthly	KPI/Measure	
Environmental Management				
Number of Hazardous Chemicals, Fuels, Oils and Lubricants Spills/Leaks to Land and < 50L and time period within which it was reported as an incident.	Contractor	Monthly	KPI	0
Number of Hazardous Chemicals, Fuels, Oils and Lubricants Spills/Leaks to Water and spills >50L and time period within which it was reported as an incident.	Contractor	Monthly	KPI	0
Total volume of Hazardous Chemicals, Fuels, Oils and Lubricants Spills/Leaks to Land	Contractor	Monthly	Measure	0
Total volume of Hazardous Chemicals, Fuels, Oils and Lubricants Spills/Leaks to Water	Contractor	Monthly	Measure	0
Storage areas for fuel and chemicals designed and operated in compliance with the CESMP	Contractor	Monthly	KPI	100%

Indicator	Responsibility	Frequency of Monitoring/ Reporting	Type	Target
Percentage of sites in compliance with site specific erosion and sediment control measures in method statements	Contractor	Monthly	KPI	100%
Change Management Procedure				
Contractor will submit the management of Change Procedure for approval within 30 days of the contract commencement date.	Contractor	n/a	Measure	
Percentage and number of change requests approved verses rejected	Contractor	Monthly	Measure	
Percentage and number of Change Management Forms submitted	Contractor	Monthly	Measure	
Percentage and number of changes of each severity category	Contractor	Monthly	Measure	
Employment				
Percentage of workers (including sub-contractors) with employment contracts	Contractor	Monthly	KPI	100%
Percentage of worker complaints resolved in less than 30 days	Contractor	Monthly	Measure	
Out of unskilled staff employed from affected community, % that is employed from affected villages	Contractor	Monthly	KPI	80%
Percentage of semi-skilled staff employed from affected provinces	Contractor	Monthly	KPI	100%
Percentage of skilled staff employed from a national level	Contractor	Monthly	KPI	80%
Number of community complaints relating to recruitment issues	Contractor	Monthly	Measure	
Number of worker grievances	Contractor	Monthly	Measure	
Number of worker strikes	Contractor	Monthly	Measure	

RESETTLEMENT ACTION PLAN (RAP) PERFORMANCE INDICATORS

The party responsible for implementing all measures set out in this table will be AYGM PIU. If there is a need for resettlement due to Contractor associated activities, then the same measures will also apply to the Contractor.

Indicator	Measure	Frequency of Monitoring / Reporting	Target
1) Input Indicators			
Overall spending on land acquisition and resettlement (including a breakdown of costs).	Cash compensation.	Bimonthly	n/a
	Costs of providing assistance, by type of assistance.		n/a
	Consultation and engagement costs.		n/a
	Costs of evaluators and surveyors.		n/a
	Costs of legal fees.		n/a
	Costs of taxes and registration fees.		n/a
	Costs of External Independent Monitoring Consultant.		n/a
	Costs of vehicles, computers, etc.		n/a
	Other costs (and type).		n/a
Total number of PAPs, who will need to be compensated, including: owners and total number of formal and informal users of Project affected land parcels.	The PAPs data has been received through the surveys and asset inventory update (detailed in **RAP Chapter 8: Eligibility and Entitlements**). Updates will be made continually as the Social and Resettlement Specialist progresses the identification and compensation of all owners/users of all affected land parcels.	Bimonthly	n/a
Number of households that must be physically displaced.	Data on this category of PAPs has been received through the surveys and asset inventory update (detailed in **RAP Chapter 8: Eligibility and Entitlements**). Updates will be made continually as the Section Manager and PIU team progresses the identification and compensation of households.	Bimonthly	n/a
Number of formal and informal businesses that must be relocated.	Data on affected businesses has been received through the surveys and asset inventory update (detailed in **RAP Chapter 8: Eligibility and Entitlements**). Updates will be made continually as the Social and Resettlement Specialist and Section Manager progress the identification and compensation of all formal/informal businesses that have been relocated by the Project.	Bimonthly	n/a
2) Output Indicators			
Number (and percentage) of PAPs who signed compensation agreements.	The percentage should be calculated from the total number of PAPs who signed compensation agreements.	Bimonthly	100%

Indicator	Measure	Frequency of Monitoring / Reporting	Target
Number (and percentage) of land parcels, residential houses, non-residential buildings and secondary structures for which compensation agreements were signed.	The percentage should be calculated from the total number of negotiated land parcels, residential houses, non-residential buildings and secondary structures, as identified by the surveys and asset inventory update (detailed in **RAP Chapter 8: Eligibility and Entitlements**).	Bimonthly	100%
Number (and percentage) of PAPs who refused to sign compensation agreements/are still deciding.	The percentage should be calculated from the total number of PAPs provided with compensation agreements. If possible, a breakdown of reasons why compensation agreements have been refused (or still have not been accepted) should be provided, with separate data on those that have not been negotiated and those that have been unattended.	Bimonthly	0%
Number (and percentage) of compensation agreements executed (compensation paid in full).	The percentage should be calculated from the total number of PAPs provided with compensation agreements. With separate reporting of compensation in accordance with national legislation and compensation in accordance with PR5.	Bimonthly	100%
Number (and percentage) of households that have been physically displaced (moved to another location).	The percentage should be calculated from the number of households which were identified as having to be physically displaced; with separate reporting of compensation in accordance with national legislation and compensation in accordance with PR5.	Bimonthly	n/a
Number (and percentage) of businesses that have been relocated.	The percentage should be calculated from the number of businesses which were identified as having to be relocated.	Bimonthly	n/a
Number of PAPs that have been provided with Settlement Deeds, if applicable	Number of Settlement Deeds that have been requested and delivered to those owning assets above the tunnels.	Bimonthly	n/a
Number of PAPs assisted by the PIU by type of assistance and by category (owners/users).	Assistance to prepare ownership documents (monetary assistance, provision of information, legal aid etc.).	Bimonthly	n/a
	Assistance to identify replacement land/residential houses for purchase.		n/a
	Assistance to construct/identify new non-residential buildings and secondary structures.		n/a
	Assistance to move or payment of moving costs.		n/a
	Assistance provided through the livelihood restoration programme[327] (as detailed in **RAP Chapter 9: Livelihood Restoration Plan**).		n/a
3) Process Indicators[328]			
Number of PIU external consultants dedicated to the implementation of this RAP.	Members of the PIU (Section Manager, Social and Resettlement Specialist, Livelihood Restoration Specialist, CLOs).	Bimonthly	n/a

[327] A livelihood restoration programme will be developed by AYGM using **Chapter 9: Livelihood Restoration Plan**. When this programme has been developed specific monitoring indicators for each assistance package will be included as part of this proposed monitoring indicator list.

Indicator	Measure	Frequency of Monitoring / Reporting	Target
	Members of other AYGM departments.		n/a
	Skill trainers and other supporting specialists included in the livelihood restoration plan.		n/a
	External Independent Monitoring Consultant		n/a
Number of newly received, open and closed grievances; any trends in grievances received; and average time for grievance processing.	Measure the time interval between grievance registration and closure as summarised below. ▪ Immediate grievance registration; ▪ CLOs contact complainant within 2 working days following complainant registration to explain the Project response process to the grievance; ▪ 10 working days for CLO to investigate and respond to complainant; and ▪ 10 working days to solve complaint, with more complex investigation resolution can take up to 30 working days maximum. Grievances should be reviewed in accordance with the process detailed in the **SEP**.	Bimonthly	Compliance or better with time intervals set out.
	Number of PAPs using the Grievance Mechanism.		n/a
	Number of cases resolved at Project-level.		n/a
	Number of cases referred to court and subjects of court cases.		n/s
Engagement activities	Number of community meetings undertaken.	Bimonthly	n/a
	Percentage of women participating in community meetings.		n/a
	Number of focus groups and workshops targeting vulnerable groups including women.		n/a
Budget and timeframes	Capacity building and training activities completed on schedule (in accordance with **RAP Chapter 12: Implementation Schedule**).	Bimonthly	100%
	Achieved activities against the agreed RAP implementation schedule.		100%
	Funds disbursement according to the **RAP Chapter 12: Implementation Schedule**.		100%
	Number of land entry protocols signed.		n/a
4) Outcome/Impact Indicators			
Average time for payment of compensation	Average time between acceptance of the offer/signing of the compensation agreements and the execution of compensation. This should also be regularly internally monitored by the External Independent Monitoring Consultant to determine if there are delays which could put PAPs in a difficult position.	Every 6 months (external monitoring)	n/a
How was the received cash compensation used/invested?	Survey to determine what affected people used compensation for, such as: replacement land, replacement residential housing, non-residential buildings and secondary structures (business and facilities), other assets or investments, and not invested for anything.	Every 6 months (external monitoring)	n/a
Has compensation been paid at full replacement cost?	Investigate whether recipients of cash compensation who bought replacement land, replacement residential houses, non-residential buildings and secondary structures (business and facilities) were able to purchase a similar (or better) property.	Every 6 months (external monitoring)	n/a

Indicator	Measure	Frequency of Monitoring / Reporting	Target
Satisfaction with replacement residential housing	Conduct household and Mukhtar surveys to determine whether displaced households are satisfied with new living arrangements (and why). In relation to the household survey, the survey structure will cover the overall household level (completed by the head of household) and separate sections/questions for their partner.	Every 6 months (external monitoring)	n/a
	Assess whether the standard of living seems to have improved or deteriorated (for example, is the household reporting that they bought new furniture, cars, equipment etc.).		n/a
	Assess whether the displaced households have an improved water supply.		n/a
Re-establishment of incomes/livelihoods	Assess whether those who were using land as a source of livelihood/income managed to re-establish this source and the same level of livelihood/income.	Every 6 months (external monitoring)	
	Assess whether informal users of land have re-established their previous level of income.		n/a
	Calculate the number of PAPs that benefited from the livelihood restoration programme.		n/a
	Number and type of vocational training courses delivered and number of PAPs who attended to evaluate the progress in implementing the livelihood restoration programme.		n/a
	Percentage of displaced persons who improved their income and standard of living using indicators such as income, employment opportunities, costs of goods and services, poverty, life expectancy, inflation rate and the number of paid holidays people receive each year.		n/a
	Assess gender and vulnerability segregated data on livelihood re-establishment.		n/a
Re-establishment of businesses	Assess whether relocated businesses have been successfully re-established. Survey of net income and comparison to baseline data as presented in **RAP Chapter 4: Affected People and Assets**.	Every 6 months (external monitoring)	n/a
	Assess whether business employees are still working after re-location. (If not, establish reasons why).		n/a
	Survey of employees and their earnings and comparison with baseline data.		n/a
Agricultural productivity	Assess land productivity against previous productivity levels.	Every 6 months (external monitoring)	n/a
	Assess suitability of animal pasture against previous productivity and accessibility levels.		n/a
	Assess whether PAPs not yet achieving pre-Project productivity are still receiving transitional assistance.		n/a
Social stability	Record the number of arguments or issues between host communities and displaced families, provided through Mukhtar and/or resettled PAPs.	Every 6 months (external monitoring)	n/a
	Identify whether the Project has caused significant access issues for PAPs.		n/a

Indicator	Measure	Frequency of Monitoring / Reporting	Target
	Identify whether rural communities, with significant percentage of population affected, maintained a sense of community.		n/a
	Percentage of physically resettled households that have the same or increased level of trust in their surrounding community members.		100%
	Percentage of physically resettled households that have the same or increased sense of security within their new community.		100%
	Identify whether the elderly populations of affected communities have been provided with suitable social support.		n/a
Health	Identify whether the Project caused health problems (physical and/or mental health issues) in nearby communities. This can be measured with submission of grievances and complaints made to the Mukhtar.	Every 6 months (external monitoring)	n/a



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