



AYGM

HALKALI-ISPARTAKULE- CERKEZKOY RAILWAY LINE

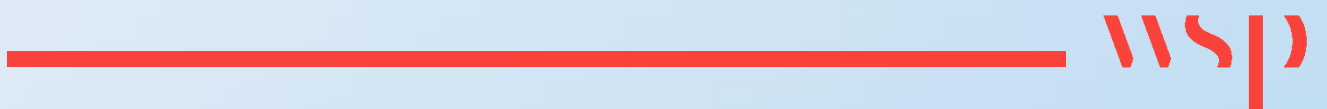
Environmental and Social Impact Assessment





18

SUMMARY



18 SUMMARY

- 18.1.1. The purpose of this chapter is to provide a summary of the potential impacts, effects and the mitigation measures which will be implemented for Project. The summary, shown in **Table 18-1**, is based upon the assessments undertaken in this ESIA (Technical Chapters 6 – 16).
- 18.1.2. The mitigation is also included in **Chapter 19: ESMP**.
- 18.1.3. There are a number of significant adverse effects which whilst mitigation is proposed for each (as outlined in **Table 18-1**), it is not possible to reduce the residual effects to the extent that they will not be significant:
- Noise and vibration:
 - Some properties are likely to be subject to significant noise levels during the construction phase of Project, particularly Bahçeşehir, Kaleiçi, İnçeğiz, Kabakça and İstasyon.
 - Some properties are likely to be subject to significant vibration levels during the construction phase of Project, particularly Halkali, Bahçeşehir, Ömerli, Kaleiçi, Gökçeali, İnçeğiz, Kabakça, Çayırdere and İstasyon.
 - The properties that are located within 25m of the Project in Kabakça and Kaleiçi are likely to be subject to significant vibration levels during the operational phase of Project due to freight movements at night.
 - The properties that are located within 25m of the Project in Bahçeşehir, Kaleiçi, İnçeğiz, Kabakça and İstasyon are likely to be subject to significant reradiated noise levels during the operational phase of Project due to freight movements at night.
 - Cultural heritage:
 - Unknown below ground heritage assets, if discovered during the below-ground construction works for the Project, may be subject to significant effects.
 - Landscape and visual:
 - Landscape Character Area 2: Province of Istanbul (the east and central sections of the Project) is likely to experience a significant change, during both construction and operation, to the nature of the landscape within the expropriation corridor. This includes a permanent alteration to the topography, loss / severance of substantial areas of established woodland / scrub and the additional of structures.
 - Residential properties within the communities of Firuzköy, Yeşilbayır, İnçeğiz, Bekirli and Küçüksinekli are likely to be subject to significant visual effects during the construction phase of the Project.
 - Residential properties within the communities of Yeşilbayır, İnçeğiz and Bekirli are likely to be subject to significant visual effects during the operational phase of the Project.
 - Residential properties in the communities of Ömerli, Bahşayış, Gökçeali, İnçeğiz, Kabakça, Bekirli and in Çerkezköy are likely to experience significant changes in visual amenity during the construction phase of the Project; and
 - Residential properties near İnçeğiz are likely to experience significant changes in visual amenity during the operational phase of the Project.
 - Climate change:

- Compared to the baseline, significant GHG emissions are anticipated to occur due to the construction of the Project.

18.1.4. The Project will also have a number of significant beneficial effects. During the construction phase these are likely to be associated with increased local employment. During the operational phase these are likely to be significant beneficial effects associated with reduced GHG emissions, increased local employment, improved occupational health and safety, improved community, health, safety and security, reduced gender harassment, improved community wellbeing and increased rail safety.

Table 18-1 - Summary of Potential Impacts, Effects and Mitigation

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
Air Quality						
Construction Dust	Monitored PM ₁₀ concentrations low throughout the study area.	Construction	Increased PM ₁₀ concentrations, dust soiling.	Risk of exposure to higher concentrations of PM ₁₀	Best practice methods -Summarised in Section 6.6 of Chapter 6: Air Quality .	Negligible (Not Significant)
Operational Emissions	Monitored exceedances of air quality standards for PM ₁₀ and NO ₂ in Istanbul and Çerkezköy (PM ₁₀ only).	Operation	Impacts to human and ecological health.	Negligible (Not Significant)	-	Negligible (Not Significant)
Noise and Vibration						
Noise	Noise levels typical of rural and suburban areas, results in Table 7-14 and Table 7-15 of Chapter 7: Noise and Vibration .	Construction	Some properties are likely to be subject to noise levels in excess of L _{Aeq,12h} 70dB in all communities assessed.	All communities are likely to experience significant effects particularly Bahçeşehir, Kaleiçi, İnçeğiz, Kabakça and İstasyon	Good practice measures and site hoarding at Bahçeşehir, Kaleiçi, İnçeğiz, Kabakça and İstasyon.	Significant (during periods of intense activity only)
	Noise levels typical of rural and suburban areas, results in Table 7-14 and Table 7-15 of Chapter 7: Noise and Vibration .	Operation	Some properties in Çatalca, Gökçeali, Kabakça and İstasyon are likely to experience a moderate adverse impact. Some properties at Kaleici are likely to experience a very large impact. Some properties at İnçeğiz are likely to experience a very large impact.	Some properties in Catalca, Gökçeali, Kabakça and İstasyon are likely to experience a Moderate Adverse (Significant) effect. Some properties in Kaleici and İnçeğiz are likely to experience a Very Large Adverse and Large Adverse (Significant), respectively.	Noise barriers, window and cuttings.	Not Significant
Vibration	It is assumed for this assessment that perceptible levels of vibration are absent at sensitive receptors near to the Project.	Construction	Properties along the Project are likely to experience a large or moderate impact.	It is likely that a Large Adverse (Significant) effect will be experienced by some receptors near to the Project in Halkali, Bahçeşehir, Ömerli, Kaleiçi, Gökçeali, İnçeğiz, Kabakça, Çayirdere and İstasyon.	<ul style="list-style-type: none"> Selection of non-vibratory construction equipment. Temporary rehousing will be offered, if necessary and effects unable to be mitigated with above actions. 	Significant (during periods of intense activity only)
	It is assumed for this assessment that perceptible levels of vibration are absent at sensitive receptors near to the Project.	Operation	Properties within 25m in Kabakça and Kaleiçi are likely to experience a large adverse impact due to freight movement at night.	Properties within 25m in Kabakça and Kaleiçi are likely to experience a Moderate Adverse	Mitigation for significant operational vibration may be avoided if the expropriation buffer is above 25m.	Significant (at properties during night-time)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
				(Significant) effect, with Neutral to Moderate effects experienced elsewhere.	Within 25m modify trackform as described in Section 7.6 of Chapter 7: Noise and Vibration .	
Reradiated Noise	It is assumed for this assessment that perceptible levels of reradiated noise are absent at sensitive receptors near to the Project.	Operation	Properties within 25m in Bahçeşehir, Kaleiçi, İnçeğiz, Kabakça and İstasyon are likely to experience a large adverse impact due to freight train movement at night.	Properties within 25m in Bahçeşehir, Kaleiçi, İnçeğiz, Kabakça and İstasyon are likely to experience a Moderate Adverse (Significant) effect, with Neutral to Moderate effects experienced elsewhere.	Increasing expropriation corridor in these areas, or alter trackform as described in Section 7.6 of Chapter 7: Noise and Vibration .	Significant (at properties during night-time)
Ecology						
Protected Areas	There are 3 IBAs crossed by the Project: Büyükçekmece Lake, Küçükçekmece Basin and Terkos Basin.	Construction	Habitat Loss Disturbance	Neutral to Minor (Not Significant)	<ul style="list-style-type: none"> Compensatory planting of oak-hornbeam woodland. ECoW. Sympathetic timing of works. 	Neutral (Not Significant)
		Operation	Disturbance Collision Mortality	Neutral (Not Significant) to Moderate (Significant)	<ul style="list-style-type: none"> Adaptive fencing to divert flying birds. 	Minor (Not Significant)
Habitats	<p>A mixture of agriculture, woodlands/scrub and built-up areas across the Zol. Includes an area of higher sensitivity oak-hornbeam woodland.</p> <p>Aquatic habitats comprise a number of watercourses, together with wetland associated with large lakes in the east of the Project.</p>	Construction	Habitat Loss	Minor (Not Significant)	<ul style="list-style-type: none"> Micrositing to avoid areas of greatest biodiversity interest. Compensatory planting of oak-hornbeam woodland to ensure no net loss for this habitat. Material contribution sufficient to support the production of a White-headed Duck Management Plan. Standard aquatic ecology mitigation measures including pollution prevention, minimising noise, vibration and lighting, and fish rescue as set out in the BMP and ESMP. 	Neutral (Not Significant)
Rare Plants	<p>Common and widespread floral assemblage across the Zol.</p> <p>Six rare plant species (including five endemics) recorded from across the Zol. One species <i>Centaurea hermannii</i> assessed as a Critical Habitat trigger species.</p>	Construction	Loss of Plants Spread of Invasive Species	Moderate to Large (Significant)	<ul style="list-style-type: none"> Translocation of plants and propagation of individuals to increase overall numbers. Invasive Species Management Plan in ESMP. ECoW. 	Minor Beneficial (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
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)	<ul style="list-style-type: none">▪ 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 animal underpass / 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)	<ul style="list-style-type: none">▪ 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 animal underpass / 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)	Pre-construction biodiversity surveys, including: <ul style="list-style-type: none">▪ Targeted bird surveys.▪ Flight activity surveys.▪ Timing of works.	Minor (Not Significant)
		Operation	Disturbance Collision Mortality/Electrocution	All species, excluding the imperial eagle – Minor (Not Significant) Imperial eagle – Large (Significant)	Adapted fencing to divert flying birds.	Minor (Not Significant)
Cultural Heritage						
Cultural Heritage	There is potential for below-ground heritage assets to be affected during the construction phase. There is potential for above ground heritage assets to be affected during the construction and phase.	Construction	Below-Ground Heritage Assets	Large Adverse (Significant)	Implementation of: <ul style="list-style-type: none">▪ Chance Finds procedure;▪ CHMP; and▪ Archaeological supervision in the area of Anastasius’s Walls.	Up to Moderate Adverse (significant) - if any below ground heritage is found during the construction phase.
		Construction	Above Ground Heritage Assets	Slight Adverse (Not Significant)	Implementation of: <ul style="list-style-type: none">▪ CHMP; and▪ ESMP (vibration monitoring programme).	Neutral (Not Significant)
		Operation	Above and Below Ground Heritage Assets	Neutral (Not Significant)	Implementation of: <ul style="list-style-type: none">▪ ESMP.	Neutral (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
Landscape and Visual						
Landscape Character Areas						
Landscape Character Area 1: Marmara	Very High Sensitivity	Construction and Operation	Permanent change to the land use along the Project. Permanent alteration of the topography Loss / severance of substantial areas of established woodland / scrub. Permanent addition of 9No. bridges, 2No. viaducts, 17No. overpasses and 26No. underpasses	Minor Adverse (Not Significant)	Reinstatement of woodland / scrub vegetation lost to the Project.– principally between chainages 21+350 – 21+650, 47+180 – 48+200; and 52+000 – 67+500.	Minor Adverse (Significant)
Landscape Character Area 2: Province of Istanbul	High Sensitivity		Permanent change to the nature of the landscape directly within the expropriation corridor of the Project (73km) in this character area, of which 9km is considered to be online, with a further 64km offline. Permanent alteration to the topography Loss / severance of substantial areas of established woodland / scrub Permanent addition of 6No. bridges, 2No. viaducts, 17No. overpasses and 25No. underpasses	Moderate /Large Adverse (Significant)	Reinstatement of woodland / scrub vegetation lost to the Project – principally between chainages 21+350 – 21+650, 47+180 – 48+200; and 52+000 – 67+500.	Moderate Adverse (Not Significant)
Landscape Character Area 3: Province of Tekirday	Medium Sensitivity		Permanent change to the land use along the Project (3km). Permanent inclusion of detracting features and the additional of permanent features.	Negligible (Not Significant)	-	Negligible (Not Significant)
Viewpoints						
Viewpoint 1	Medium Sensitivity	Construction and Operation	No change to the nature of the view.	Neutral (Not Significant)	-	Neutral (Not Significant)
Viewpoint 2	Residential Properties (High Sensitivity)	Construction	Visual awareness of construction activities, including construction compound.	Minor Adverse (Not Significant)	Restricted hours of working – avoidance of use of machinery during those hours when residents are most likely to be at home, thus reducing the potential of visual disturbance within view.	Minor Adverse (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
	Road Users (Low Sensitivity)	Construction	Glimpsed views of construction activities including visual awareness of construction activities.	Negligible (Not Significant)	-	Negligible (Not Significant)
	Residential Properties (High) Road Users (Low)	Operation	Main Project is concealed below ground (tunnel). Where a short section of the Project is above ground, it is located to the west of the existing railway thus is visually perceived as an alteration to an existing feature within the nature of the view.	Neutral (Not Significant)	-	Neutral (Not Significant)
Viewpoint 3	Residential Properties (High Sensitivity)	Construction and Operation	No change to the nature of the view.	Neutral (Not Significant)	-	Neutral (Not Significant)
Viewpoint 4	Residential Properties (High Sensitivity)	Construction	Visual awareness of construction activities.	Moderate Adverse (Significant)	Restricted hours of working – avoidance of use of machinery during those hours when residents are most likely to be at home, thus reducing the potential for visual disturbance within the view.	Moderate Adverse (Significant)
		Operation	Magnitude of change is reduced due to the proximity of the Project to the existing railway. The Project will be perceived as an alteration of an existing feature within the view. Frequency of trains within view will increase by 80%	Minor Adverse (Not Significant)	Visual screening in this instance would change the character of the environment - no screen mitigation planting has been proposed in this instance.	Minor Adverse (Not Significant)
Viewpoint 5	Users of the Public Open Space (Medium Sensitivity)	Construction	Visual awareness of construction activities. Opening up of view following vegetation clearance along the western edge of the existing railway.	Minor Adverse (Not Significant)	None additional identified	Minor Adverse (Not Significant)
		Operation	Visual awareness of trains using the Project.	Minor Adverse (Not Significant)	Where space allows, reinstate screen planting along the western edge of the Project (within the limits of the expropriation corridor only).	Negligible (Not Significant)
Viewpoint 6	Residential Properties (High Sensitivity) Users of Footpath (High Sensitivity)	Construction	Visual awareness of construction activities.	Minor Adverse (Not Significant)	Restricted hours of working – avoidance of use of machinery during those hours when residents are most likely to be at home, thus reducing the potential of visual disturbance within the view.	Minor Adverse (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
	Road Users (Low Sensitivity)	Construction	Visual awareness of construction activities.	Minor Adverse (Not Significant)	-	Minor Adverse (Not Significant)
	Residential Properties (High Sensitivity) Users of The Public Footpath (High Sensitivity)	Operation	Visual awareness of trains using the Project.	Negligible (Not Significant)	Limited opportunity to provide screen planting (especially to the east of the railway) or for adjacent residents living at 2 storeys or above who look down on the Project.	Negligible (Not Significant)
	Road Users (Low Sensitivity)	Operation		Negligible (Not Significant)		Negligible (Not Significant)
Viewpoint 7	Residential Properties (High Sensitivity)	Construction	Slight visual awareness of construction activities.	Minor Adverse (Not Significant)	Restricted hours of working – avoidance of use of machinery during those hours when residents are most likely to be at home, thus reducing the potential of visual disturbance within view.	Minor Adverse (Not Significant)
		Operation	Visual awareness of trains using the Project – offset by the frequency of vehicle movement along the public highway.	Negligible (Not Significant)	Visibility of the Project predominantly screened from view by intervening topography – no specific mitigation measures proposed.	Negligible (Not Significant)
Viewpoint 8	Residential Properties (High Sensitivity)	Construction	Visual awareness of construction activities. In some instances, the works are adjacent to residential property boundaries.	Large Adverse (Significant)	Restricted hours of working – avoidance of use of machinery during those hours when residents are most likely to be at home, thus reducing the potential of visual disturbance within view.	Large Adverse (Significant)
	Road Users (Low Sensitivity)	Construction	Visual awareness of construction activities.	Minor Adverse (Not Significant)	-	Minor Adverse (Not Significant)
	Residential Properties (High Sensitivity)	Operation	Visual awareness of a prominent new linear feature within view.	Large Adverse (Significant)	Elements of screen planting on either side of the Project should be considered, along the bottom section of the embankments and where not at odds with the character of the landscape and where outside the railway corridor. Gradient of embankments proposed at a gradient of 1:6 in order to provide a more gradual change to local topography. All planting to be located within the limits of the expropriation corridor only.	Moderate Adverse (Significant)
	Road Users (low sensitivity)	Operation	Project raised on embankment. Tunnel entrance discernible within view. Increase in detracting features within view, in the form of catenary posts. Frequent introduction of visual disturbance within view of trains.	Minor Adverse (Not Significant)		Minor Adverse (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
Viewpoint 9	Residential Properties (High Sensitivity)	Construction	Mass vegetation clearance in order to facilitate the construction of the Project, opening up views Visual awareness of the construction of the tunnel – most significant impact associated with the construction of the section of cut and cover tunnel	Moderate Adverse (Significant)	Restricted hours of working – avoidance of use of machinery during those hours when residents are most likely to be at home, thus reducing the potential of visual disturbance within view.	Moderate Adverse (Significant)
	Road Users (Low Sensitivity)	Construction	Visual awareness of reprofiled earthworks.	Minor Adverse (Significant)	-	Minor Adverse (Not Significant)
	Residential Properties (High Sensitivity)	Operation	Visual awareness of reprofiled earthworks.	Moderate Adverse (Significant)	Reinstatement of woodland upon reprofiled earthworks, where the method of construction allows (restrictions may result due to the method of tunnel construction).	Moderate Adverse (Significant)
	Road Users (Low Sensitivity)	Operation	Visual awareness of reprofiled earthworks.	Minor Adverse (Significant)	-	Minor Adverse (Not Significant)
Viewpoint 10	Residential Properties (High Sensitivity)	Construction	Visual awareness of construction activities.	Minor Adverse (Not Significant)	Restricted hours of working – avoidance of use of machinery during those hours when residents are most likely to be at home, thus reducing the potential of visual disturbance within view.	Minor Adverse (Not Significant)
		Operation	Project perceived as an alteration to existing features within the view.	Negligible (Not Significant)	Given the open nature of the landscape, screen planting would not be appropriate and would be at odds with the character of the landscape.	Negligible (Not Significant)
Viewpoint 11	Residential Properties (High Sensitivity)	Construction	Visual awareness of construction activities – principally the construction of the bridge between chainage 42+150 – 42+246. Localised vegetation clearance opening up of views – visibility of Project and existing railway.	Moderate Adverse (Significant)	Restricted hours of working – avoidance of use of machinery during those hours when residents are most likely to be at home, thus reducing the potential of visual disturbance within view.	Moderate Adverse (Significant)
	Road Users (Low Sensitivity)	Construction		Minor Adverse (Not Significant)		Minor Adverse (Not Significant)
	Residential Properties (High Sensitivity)	Operation	Permanent change to the nature of the view – principally through the addition of an 11m high bridge between chainage 42+150 – 42+246. Increase in awareness of visual disturbance from trains.	Moderate Adverse (Significant)	Where available space allows, proposed replacement screen planting (outside the railway corridor but within the limits of the expropriation corridor only).	Moderate Adverse (Significant)
	Road Users (Low Sensitivity)	Operation		Negligible (Not Significant)		Negligible (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
Viewpoint 12	Residential Properties (High Sensitivity)	Construction	Visual awareness of construction activities – principally the construction of the cut and covered tunnel between chainage 47+700 – 48+650 and the 2 viaducts. Significant earth reprofiling associated with the construction of the offline section of the Project.	Moderate Adverse (Significant)	Restricted hours of working – avoidance of use of machinery during those hours when residents are most likely to be at home, thus reducing the potential of visual disturbance within view.	Moderate Adverse (Significant)
		Operation	Permanent change to the nature of the view, due to proposed earth works and the presence of 2 viaducts. Frequent visual disturbance within the view from the passing of trains not previously experienced within the area.	Moderate Adverse (Significant)	-	Moderate Adverse (Significant)
Viewpoint 13	Residential Properties to the south (High Sensitivity)	Construction	Visual awareness of construction activities from those properties to the north of the existing railway.	Minor Adverse (Not Significant)	Restricted hours of working – avoidance of use of machinery during those hours when residents are most likely to be at home, thus reducing potential visual disturbance within the view.	Minor Adverse (Not Significant)
	Residential Properties to the north (High Sensitivity)	Construction		Moderate Adverse (Significant)	-	Moderate Adverse (Significant)
	Road Users (Low Sensitivity)	Construction	Visual awareness of construction activities.	Negligible (Not Significant)	-	Negligible (Not Significant)
	Residential Properties to the south (High Sensitivity)	Operation	Project dominant within views looking in a northerly direction - change to the nature of the view in this direction formally uninterrupted views of the open countryside. Reduced magnitude of change due to the Project being at grade along this section of the Project. Frequent visual disturbance of trains using the Project.	Minor Adverse (Not Significant)	Proposed screen planting along the southern edge of the Project (where outside the railway corridor but within the limits of the expropriation corridor only) – screening views of catenary posts and passing trains.	Negligible (Not Significant)
	Residential Properties to the north (High Sensitivity)	Operation		Minor Adverse (Not Significant)	-	Minor Adverse (Not Significant)
	Road Users (Low Sensitivity)	Operation		Negligible (Not Significant)	-	Negligible (Not Significant)
Viewpoint 14	Road Users (Low Sensitivity)	Construction	Some awareness, particularly in winter, of construction activity, with glimpsed views through the vegetation, but the noise of road vehicles and the vehicle movement are already detracting features of the view.	Negligible (Not Significant)	-	Negligible (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
			Visual awareness will be limited due to the retention of the wide belt of intervening established vegetation, which will screen all views to the north.			
		Operation	Some awareness, particularly in winter, of passing trains with glimpsed views through the vegetation, but the noise of road vehicles and the vehicle movement are already detracting features of the view. Visual awareness will be limited due to the retention of the wide belt of intervening established vegetation, which will screen all views to the north.	Negligible (Not Significant)	-	Negligible (Not Significant)
Viewpoint 15	Road Users (Low Sensitivity)	Construction	Visual awareness of some but not all construction activities within the distance. Extensive vegetation clearance works are required, in order to facilitate the construction of the Project , which will result in the opening up of views.	Minor Adverse (Not Significant)	-	Minor Adverse (Not Significant)
		Operation	Visual awareness of the Project above the canopies of the trees, where it is raised on embankment.	Minor Adverse (Not Significant)	Proposed replacement planting of woodland vegetation upon embankment slopes, where the method of construction allows and where outside the railway corridor but within the limits of the expropriation corridor.	Negligible (Not Significant)
Visual Amenity						
Risalet Sokagi (within the main settlement of Omerli)	Residential Properties (High Sensitivity)	Construction	Demolition of properties within the expropriation corridor the Project. Visual awareness of construction activities associated with the construction of the tunnel and offline section of the Project.	Large Adverse (Significant)	Restricted hours of working will be proposed within built up areas, where the construction phase of the works is considered to impact on residential properties, avoiding the of use of machinery during those hours when residents are most likely to be at home, thus reducing the potential of visual disturbance within view, further details are provided within Chapter 7: Noise and Vibration .	Large Adverse (Significant)
		Operation	Permanent change to a number of residential property boundaries.	Minor Adverse (Not Significant)	Proposed screen planting along the foot of the embankment (where outside	Negligible (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
			Permanent change to the topography earth form directly to the east of the settlement where the Project is concealed below ground within a tunnel – associated above ground earth works.		the railway corridor but within the limits of the expropriation corridor).	
Isolated Farmstead (chainage 24+800)	Residential Properties (High Sensitivity)	Construction	Visual awareness of construction activities associated with the construction of the tunnel and offline section of the Project. Vegetation clearance - opening up of views along the Project.	Moderate Adverse (Significant)	Replacement planting to be carried out (outside the railway corridor but within the limits of the expropriation corridor).	Moderate Adverse (Significant)
		Operation	Permanent change to the landform directly to the south of property. Visual awareness of the Project screened from view below ground within the tunnel.	Minor Adverse (Not Significant)	Replacement woodland planting to be carried out on earth embankments (where outside the railway corridor but within the limits of the expropriation corridor).	Negligible (Not Significant)
Residential Properties (to the west of the D569, at chainage 36+499)	Residential Properties (High Sensitivity)	Construction	Demolition of residential properties and other above ground structures. Visual awareness of construction activities.	Large Adverse (Significant)	Stockpiles to have a maximum height of 5m, in order to reduce visual awareness within views. However, where topsoil is to be stripped and stored on site temporarily for reuse, the stockpile mounds will be stored at a maximum height of 2m, in order to preserve the structural integrity of the soil. Where topsoil is to be stored for a prolonged period of time (such as for 6 months or more) it is proposed that the mounds be temporarily seeded with an appropriate grass seed mix in order to reduce the visual prominence of the temporary soil mounds further within view.	Large Adverse (Significant)
		Operation	Permanent change to the landform. Permanent change to a number of residential property boundaries.	Minor Adverse (Not Significant)	-	Minor Adverse (Not Significant)
Residential Properties (near Akoren-Incegiz Yolu, between chainage 42+150 – 42+246)	Residential Properties (High Sensitivity)	Construction	Permanent change to the nature of the view – principally through the addition of an 11m high bridge between chainage 42+150 – 42+246.	Moderate Adverse (Significant)	Restricted hours of working – avoidance of use of machinery during those hours when residents are most likely to be at home, thus reducing the potential of visual disturbance within view.	Moderate Adverse (Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
			Localised vegetation clearance opening up of views – visibility of Project and existing railway.			
		Operation	Permanent change to the nature of the view – principally through the addition of an 11m high bridge between chainage 42+150 – 42+246. Increase in awareness of visual disturbance from trains.	Moderate Adverse (Significant)	Where available space allows, and where outside the railway corridor, proposed replacement screen planting (within the limits of the expropriation corridor).	Moderate Adverse (Significant)
Residential Properties (at Kabakca, off Akoren Yolu, at chainage 44+600)	Residential Properties (High Sensitivity)	Construction	Demolition of residential properties and other above ground structures. Visual awareness of construction activities including tunnel to the west.	Large Adverse (Significant)	-	Large Adverse (Significant)
		Operation	Permanent change to the landform. Permanent change to a number of residential property boundaries.	Minor Adverse (Not Significant)	-	Minor Adverse (Not Significant)
Residential Properties (to the north of Akoren along Bekirli Yolu)	Residential Properties (High Sensitivity)	Construction	Visual awareness of construction activities associated with the construction of the tunnel and offline section of the railway between chainage 47+700 – 48+650.	Large Adverse (Significant)	Restricted hours of working – avoidance of use of machinery during those hours when residents are most likely to be at home, thus reducing the potential of visual disturbance within view.	Large Adverse (Significant)
		Operation	Permanent change to the landform to the north. Visual awareness of the Project screened from view below ground within the tunnel	Minor Adverse (Not Significant)	Replacement woodland planting to be carried out on earth embankments (where outside the railway corridor and within the limits of the expropriation corridor).	Negligible (Not Significant)
Residential Properties (at chainage 76+000 – 76+700)	Residential properties (High Sensitivity)	Construction	Demolition of properties directly below the footprint of the Project. Visual awareness of construction activities associated with the construction of the offline section of the Project.	Large Adverse (Significant)	-	Large Adverse (Significant)
		Operation	Permanent change to a number of residential property boundaries.	Minor Adverse (Not Significant)	-	Minor Adverse (Not Significant)
Surface Water Environment						
Surface Water Environment	Project crosses several large watercourses including Sazli Stream,	Construction	Increased pollution risks to surface water bodies from increased	Large Adverse (Significant)	■ Implementation of sediment and erosion control measures.	Minor Adverse (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
	<p>Hadımköy Stream / Eşkinoz Creek, Camasir Creek, Karasu Stream, Ambar Creek and many smaller tributaries.</p> <p>Project is in the drainage catchment of Küçükçekmece Lake, Büyükçekmece Lake and Durugöl Lake, as well as smaller ponds including Bahçeşehir Pond, İnceğiz Pond, Sinekli Pond and Çayirdere Pond.</p> <p>Project generally at low risk of flooding although fluvial floodplains may be present along alignment of key watercourses.</p>		sedimentation in overland flow and surface water discharge.		<ul style="list-style-type: none"> Minimise works in watercourse channels and minimise vegetation clearance. A dry-working area for works will be created within a watercourse channel or within the floodplain wherever possible. 	
		Construction	Increased pollution risks to surface water bodies from spillage of fuels or other harmful substances contained in overland flow.	Moderate Adverse (Significant)	<ul style="list-style-type: none"> Appropriate storage and disposal of waste. Maintenance of vehicles and mechanical plant. Provision of spill containment equipment. A dry-working area for works will be created within a watercourse channel or within the floodplain wherever possible. 	Neutral (Not Significant)
		Construction	Increased risks to surface waters from discharge of foul effluent from construction compounds / construction workers accommodation.	Neutral (Not Significant)	Wastewater removed via tanker and disposed of at wastewater treatment plant.	Neutral (Not Significant)
		Construction	Increased risks to surface waters from increased water demand from construction compounds / construction workers accommodation.	Neutral (Not Significant)	<ul style="list-style-type: none"> Non-potable water pumped from groundwater. Drinking water provided in bottled containers. 	Neutral (Not Significant)
		Construction	Increased pollution risks to surface waters from discharge, migration or spillage of fuels and other harmful substances from construction compounds.	Moderate Adverse (Significant)	<ul style="list-style-type: none"> Appropriate storage of materials and plant. Provision of spill containment equipment. Robust pre-treatment of runoff. 	Neutral (Not Significant)
		Construction	Impact to watercourse flows and connectivity associated with diversion, restriction or blockage of watercourses.	Minor Adverse (Not Significant)	Hydraulic connectivity must be maintained, and no more than two-thirds of the watercourse capacity should be blocked. Temporary channels provided, if required.	Neutral (Not Significant)
		Construction	Increased flood risk associated with temporary works and surface water discharges.	Moderate Adverse (Significant)	<ul style="list-style-type: none"> Minimise works in or adjacent to watercourse channels. Hydraulic connectivity must be maintained, and no more than two-thirds of the watercourse capacity 	Neutral (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
					should be blocked. Temporary channels provided, if required. <ul style="list-style-type: none"> Provide temporary channels to maintain hydraulic connectivity if required. Implement construction-phase drainage strategy. 	
		Operation	Pollution to surface water bodies from surface water discharge.	Neutral (Not Significant)	<ul style="list-style-type: none"> Provision of appropriate drainage system. Maintain existing drainage and waste management systems serving high-risk areas. 	Neutral (Not Significant)
		Operation	Pollution to surface water bodies from wastewater discharge.	Neutral (Not Significant)	Maintain existing station drainage facilities.	Neutral (Not Significant)
		Operation	Impacts to surface water bodies from increased water demand.	Neutral (Not Significant)	Maintain existing station water supply facilities.	Neutral (Not Significant)
		Operation	Coastal flood risk to the Project from sea level rise and storm surge.	Very Large Adverse (Significant)	Further consideration of the inclusion of flood defence structures at the entrance of the tunnel beneath the Kanal Istanbul project and inclusion of a flood warning system.	Neutral (Not Significant)
		Operation	Increased flood risk from proposed drainage systems.	Moderate Adverse (Significant)	<ul style="list-style-type: none"> New drainage system with sufficient capacity for Q100 event. Attenuation may be required for new impermeable surfaces. Regular inspection and maintenance. Further assessment of climate change effects. 	Neutral (Not Significant)
		Operation	Increased flood risk from crossing of watercourses, with bridge piers located within channel.	Major Adverse (Significant)	<ul style="list-style-type: none"> Watercourse crossings with sufficient capacity for the Q100 event. Piers within watercourses designed to reduce displacement of water. Further assessment of climate change effects. 	Neutral (Not Significant)
		Operation	Risk to Project and increased flood risk from location of Project in fluvial	Moderate Adverse (Significant)	<ul style="list-style-type: none"> Further assessment of impacts to fluvial floodplain storage and 	Minor Adverse (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
			floodplain and displacement of flood water storage.		<div>conveyance, and provision of mitigation.</div> <ul style="list-style-type: none">Further assessment of risks to Project and inclusion of mitigation in design.Piers within watercourses designed to reduce displacement of water.Further assessment of climate change effects.	
		Operation	Impacts to hydrology, hydromorphology and flow dynamics from proposed crossing of watercourses.	Minor Adverse (Not Significant)	<ul style="list-style-type: none">Maintain stability, profile, hydraulic connectivity and hydraulic capacity of watercourses.Provision of erosion control measure up and down stream of the watercourse crossing and around the bridge piers.Provision of low flow channels through proposed culverts.	Minor Adverse (Not Significant)
Geology and Hydrogeology						
Geology and Hydrogeology	<p>The bedrock geology beneath the Project is comprised of Ergene group (sandy, shaley conglomerates) and Yenimuhacir group (sandstones, shales, minor coal, siltstones, limestones). This is overlain in places by recent superficial deposits of Alluvium (sand, clays, silts and gravels).</p> <p>Where Alluvium is present it may have the potential to act as groundwater aquifers where the main component is granular (sand and gravel) or aquitard where there is a significant clay or silt component.</p> <p>The Ergene and Yenimuhacir groups are permeable and are known to contain groundwater in quantities capable of supplying public water supply.</p> <p>The sensitivity of the shallow geology is Low, due to the limited</p>	Construction	Potential Impacts on Topsoil and Groundwater Quality from leaks / spills from HGVs, Machinery, and Hazardous Material Storage	Neutral or Minor Adverse (Not Significant)	<ul style="list-style-type: none">During the construction phase of the Project, the Contractor will implement the ESMP which includes measures to reduce pollution and contamination associated with airborne substances and oil and / or petroleum leaks / spills.Testing and removal of material arisings in accordance with the Materials Management Plan and the Site Waste Management Plan.An ERF (including a Spill Management Plan),Method Statements for temporary activities which will include the following activities: Storage Areas, construction of bridges, tunnels, viaducts, storage and access roads.	Neutral (Not Significant)
		Construction	Potential Impact on Soil Erosion from Construction Activities	Minor Adverse (Not Significant)	The detailed design of the Project will also incorporate the following measures to reduce the likely release of loose material or material with the potential to become loose in-situ:	Neutral (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
	potential for aquifers. The sensitivity of the permeable Ergene and Yenimuhacir groups is considered to be High due to their potential as potable water resources.				<ul style="list-style-type: none"> Slope stabilisation – including mulching (straw mulching), brushwood mulching, erosion control blankets, soil binders (e.g. polyacrylamide) and gravelling; Retaining walls – to retain loose materials on slopes where it would not naturally be held, for example on near vertical or vertical slopes; Sediment traps and basins – which will intercept and retain sediment-laden runoff; Drainage channels – which will divert run-off water; Treatment systems – to remove material contained within the run-off water; and Revegetation – to increase the stability of the loose materials and surfaces which become exposed during the construction phase of the Project. 	
		Construction	Potential Impact on Soil Loss and Degradation (Quarry Resources and Surplus Material Disposal Sites)	Neutral or Minor Adverse (Not Significant)	The ESMP will incorporate measures to ensure the stability of the quarry resources and excavated material disposal sites and reduce the likelihood of soil loss and contamination, respectively. Such measures will include appropriate compaction and consideration of groundwater levels. The Materials Management Plan will set out the criteria for borrow pits and disposal sites, ensuring that they are located away from sensitive locations.	Minor Adverse (Not Significant)
		Construction	Potential Loss of Fertile Topsoil	Minor or Moderate Adverse (Significant)	Limited temporary land take of agricultural land is proposed during construction, however the ESMP includes measures to restore lost fertile topsoil following completion of the Construction Phase where suitable.	Minor Adverse (Not Significant)
		Construction	Potential Soil Stability and Risk of Landslides	Neutral or Minor Adverse (Not Significant)	The ESMP includes measures associated with erosion protection, such as vegetation planting and measures to improve the stability of slopes during Project construction, such as protective nets.	Neutral (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
		Construction	Potential Effects from Excavation of Potentially Contaminated Soils	Minor Adverse (Not Significant) to Minor or Moderate Adverse (Significant)	<p>Mitigation against potential effects from potentially contaminated soils will be managed through implementation of the ESMP which will include:</p> <ul style="list-style-type: none"> ■ A Materials Management Plan, which will outline measures to protect the quality of soils used during construction or directly impacted by construction activities. The Plan will include measures for contaminated land. ■ The Health and Safety Plan, which will outline measures to keep the construction workers safe including personal protection equipment requirements. ■ Construction Plans and Method Statements – Slope Stabilisation, bridge construction, viaducts construction, underpass and overpass construction and tunnel construction, Tunnel Handover Plan and Blasting Management Plan, which will outline measures to ensure a safe environment for construction workers. ■ In accordance with the ERF, an Emergency Response Plan will be produced prior to construction (including a Spill Management Plan), which will include a procedure for leak / spill prevention from HGVs, machinery, and hazardous material storage. 	Minor Adverse (Not Significant)
		Construction	Potential Effects on Groundwater Quality, Flow, and Recharge	Neutral or Minor Adverse (Not Significant)	<ul style="list-style-type: none"> ■ A detailed Hydrogeological Model and Risk Assessment and Ground Investigation should be undertaken in particular for the design of Tunnel 1 to understand geological and hydrogeological conditions. ■ Long term and seasonal groundwater monitoring should be undertaken prior to construction to allow for baseline conditions to be understood and monitor changes (such as those to turbidity and groundwater levels) during boring of 	Minor Adverse (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
					<p>Tunnel 1 such as to prevent degradation of the groundwater resource or potential quality of water supply.</p> <ul style="list-style-type: none"> Foundation Risk Assessments and Piling Risk Assessments for bridges, viaducts, overpasses, underpasses and cut and cover tunnels. They should outline measures to protect groundwater resources as part of the design and during construction. 	
		Operation	Potential Effects on Topsoil Quality and Soil Erosion	Minor Adverse (Not Significant)	<ul style="list-style-type: none"> In order to prevent soil erosion, loss and degradation along the Project alignment the Operational Soil Management Plan in the ESMP includes measures to: <ul style="list-style-type: none"> Maintain sediment traps and basins, drainage channels and treatment systems; and Maintain slope (cuttings and embankment). In accordance with the ERF, an Emergency Response Plan will be produced prior to operation which will include details of the emergency response team(s) who will assess the risk of hazardous material releases and working to avoid any harmful effects in the event of an accident or incident and details and procedure for reporting emergencies, including coordination with the national relevant authorities. It will also include: <ul style="list-style-type: none"> Maintenance and thorough quality control processes including inspections for maintenance depots; Leak/ spill management; Procedure to be followed to prevent pollution / contamination of soil and groundwater; and Natural disaster response. Document control procedures for the storage of maintenance materials, 	Neutral (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
					including the use of Material Safety Data Sheets; ■ An Operational Maintenance Plan will be prepared.	
		Operation	Potential Soil Stability and Risk of Landslides	Minor Adverse (Not Significant)	In order to mitigate risks from soil stability and landslide along the Project alignment the Operational Soil Management Plan in the ESMP will be prepared. It will include revegetation and/or maintenance of vegetation to increase the stability of potentially loose materials and surfaces which may develop during the operational phase of the Project.	Neutral (Not Significant)
		Operation	Potential Effects on Groundwater Quality, Flow, and Recharge	Minor Adverse (Not Significant)	Operational Maintenance Plan will be produced to manage maintenance and repairs.	Neutral (Not Significant)
		Operation	Seismic Activity	Neutral (Not Significant)	In accordance with the ERF , an Emergency Response Plan will be produced prior to operation.	Neutral (Not Significant)
Materials and Waste						
Materials	Using professional judgement, resource availability within Turkey is considered to be sufficient to supply the materials required for construction without significant detriment to overall stocks, supplies and production.	Construction	Material resource consumption	Minor Adverse (Not Significant)	Best practice methods should be implemented.	Not Significant
Waste	Remaining landfill capacity data is not available to establish a clear baseline from which the assessment can be undertaken.	Construction	Generation and disposal of waste to landfill	Large Adverse (Significant)	■ Maximise reuse and recovery of site arisings and waste generated. ■ Develop and implement a Site Waste Management Plan and Materials Management Plan .	Not Significant (professional judgement would indicate that if all mitigation measures are adopted, the effects of the Project would be not significant)
Climate Change						
GHG	No GHG emissions as no construction activities would be undertaken.	Construction	GHG emissions are anticipated to occur due to construction of the Project.	Moderate Adverse (Significant)	As listed in the mitigation section of Chapter 14: Climate Change .	Moderate Adverse (Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
	Baseline emissions would occur from the operation of the existing rail and end-user traffic.	Operation	Changes in GHG emissions are anticipated to occur due to modal shift (road to rail).	Moderate Beneficial (Significant)	As listed in the mitigation section of Chapter 14: Climate Change .	Moderate Beneficial (Significant)
Climate Resilience	<ul style="list-style-type: none"> ■ Increase in average temperature. ■ Increase in extreme temperatures. ■ Decrease in annual precipitation. ■ Little change in extreme precipitation events. ■ Increase in wind speed ■ Sea level rise. 	Construction	Drying out and cracking of ground and access road surfaces leading to slower vehicle movements and repair work, resulting in construction delays.	Adverse (Not Significant)	Inherent mitigation measures (Table 14-21 of Chapter 14: Climate Change). Additional mitigation measures (Table 14-25 of Chapter 14: Climate Change)	Adverse (Not Significant)
			Shorter drying times of materials.	Adverse (Significant)		
			Deformation and melting of materials.	Adverse (Not Significant)		
			Overheating of machinery leading to delay.	Adverse (Not Significant)		
			Health and safety risks from heatstroke and UV radiation.	Adverse (Not Significant)		
			Buildings vulnerable to overheating, risk to users.	Adverse (Significant)		
		Operation	Drought: Prolonged dry periods may lead to drying out and cracking of earthworks and soils, increased repair costs and slower journey times.	Adverse (Not Significant)	Inherent mitigation measures (Table 14-22 of Chapter 14: Climate Change). Additional mitigation measures (Table 14-25 of Chapter 14: Climate Change)	Adverse (Not Significant)
			Drought: Increase in dust on the railway tracks leading to reduced visibility.	Adverse (Not Significant)		
			Increase in Average Temperature: More rapid deterioration of materials and associated infrastructure such as signage.	Adverse (Not Significant)		
			Increase in Average Temperature: Deformation of tracks leading to increased repair costs and slower journey times.	Adverse (Not Significant)		
			Extreme Temperature (heatwave): Rail tracks buckling or deforming under extreme heat.	Adverse (Significant)		
			Extreme Temperature (heatwave): More rapid deterioration of materials and associated infrastructure such as signage.	Adverse (Not Significant)		

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
			Extreme Temperature (heatwave): Occurrence of track fires.	Adverse (Not Significant)		
			Wind: Destabilisation of overhead lines.	Adverse (Not Significant)		
			Wind: Power loss of overhead lines.	Adverse (Significant)		
			Sea Level: Flooding of railway tracks resulting in disruption to service.	Adverse (Not Significant)		
			Decrease in Average Precipitation: Drying out and cracking of substrate leading to damage to foundations and destabilisation of structure.	Adverse (Significant)		
			Drought: Drying out and cracking of substrate then damaging foundations and destabilisation of structure.	Adverse (Significant)		
			Average Temperature: Increase in expansion of materials leading to structural damage.	Adverse (Not Significant)		
			Average Temperature: Increase in earth pressure.	Adverse (Not Significant)		
			Extreme Temperature: Increase in expansion of materials leading to structural damage.	Adverse (Significant)		
			Extreme Temperature: Increase in earth pressure.	Adverse (Not Significant)		
			Extreme Temperature: Melting/deformation of materials.	Adverse (Not Significant)		
			Wind: Increase in wind loading leading to destabilisation or safety risks to users.	Adverse (Not Significant)		
			Wind: Wind-driven rain infiltration into materials and surfaces which can increase maintenance costs and operational disruption.	Adverse (Not Significant)		
			Sea Level: Flooding of underpasses and tunnels.	Adverse (Not Significant)		

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
			Sea Level: Scour of structures, weakening and degrading materials.	Adverse (Not Significant)		
			Average Precipitation: Drying out of soils and cracking of materials.	Adverse (Not Significant)		
			Drought: Drying out of soils and cracking of materials.	Adverse (Not Significant)		
			Dust and debris clogging drainage channels and requiring clearing.	Adverse (Not Significant)		
			Dust and debris clogging drainage channels and requiring clearing.	Adverse (Not Significant)		
			Windborne dust and debris clogging drainage channels and requiring clearing.	Adverse (Not Significant)		
			Drainage infrastructure overwhelmed leading to surface water flooding.	Adverse (Not Significant)		
			Drying out of soils, death of vegetation due to lack of moisture, increased maintenance requirements.	Adverse (Not Significant)		
			Shrinking and cracking of soils.	Adverse (Not Significant)		
			Average Temperature: Drying out of soils, death of vegetation due to scorching.	Adverse (Not Significant)		
			Extreme Temperature: Drying out of soils, death of vegetation due to scorching.	Adverse (Not Significant)		
			Waterlogging and erosion leading to destabilisation.	Adverse (Not Significant)		
			Death of planting due to waterlogging.	Adverse (Not Significant)		
Social						
Land Acquisition/Livelihood Restoration – Land Acquisition and Land Use	Land parcels will be acquired over a combined land area of over 5 million square metres. This will lead to households being affected (either economically and/or physically).	Construction	The Project will require the acquisition and provision of replacement land and some houses / structures.	Large Adverse to Moderate Adverse (Significant)	Implementation of the RAP .	Minor Adverse (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
	Further information on the land and persons are provided RAP.					
Land Acquisition/Livelihood Restoration – Land for Construction Compounds	As the Contractor had not been commissioned at the time of writing, the compound locations are not yet available, however, 3 indicative locations have been identified based on assumptions from the under construction Çerkezköy to Kapikule railway section and agreed with the Project Team. The selected locations are expected to be unused (barren land with no residential houses).	Construction	Impacts of the construction compounds on local communities.	Minor Adverse (Not Significant)	<ul style="list-style-type: none"> The Contractor will be required to apply the construction compound selection criteria in the ESMP, which will reduce the potential impacts on land use and local communities. In case of temporary physical and economic displacement being needed for the development of the construction compounds, the RAP principles and mitigation measures will be followed by the contractor(s) setting up these construction compounds, and this requirement is included in the ESMP for the Project. 	Minor Adverse (Not Significant)
Employment and Economy – Employment	There has been an increase in national unemployment rate. It is estimated that there will be approximately 1,100 direct contract workers to be assigned to complete the construction of the Project.	Construction	Increased local employment opportunities.	Large Beneficial (Significant)	<ul style="list-style-type: none"> The Contractor will be encouraged to employ local workers by providing preference to suitably qualified and experienced applicants from local communities. Develop and implement an Employment Plan. 	Very Large Beneficial (Significant)
	During the operation, the number of workers will be increased at each station and additional support jobs to be created.	Operation		Minor Beneficial (Not Significant)	<ul style="list-style-type: none"> TCDD Transport (and TCDD) will be encouraged to employ local workers by providing preference to suitably qualified and experienced applicants from local communities. Develop and implement an Employment Plan. 	Large Beneficial (Significant)
Employment and Economy – Location of Construction Workers' Accommodation	The potential locations are expected to be unused (barren land with no residential houses).	Construction	If the location of the construction compounds, and thus the construction workers' accommodation, is not carefully selected and agreed through consultations with the local communities, there may be the impacts on local communities, particularly if the construction compounds are to be located in proximity to such communities.	Moderate Adverse (Significant)	The Contractor will consult with affected communities on suitable construction compound locations in accordance with environmental, social and economic criteria, as set out in the ESMP and SEP .	Minor Adverse (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
Employment and Economy – Labour Influx	The working population primarily comprises people working in industry, agriculture, and animal husbandry.	Construction	Potential labour influx as a result of large workforce moving into the area.	Moderate Adverse (Significant)	As required in the ESMP: <ul style="list-style-type: none"> Develop and implement a Construction Workers' Accommodation Management Plan. Implement the Construction Workers' Code of Conduct in the CMP. Develop and implement a Health, Safety and Security Plan. 	Minor Adverse (Not Significant)
Labour and Working Condition – Child Labour, Forced Labour and Employment Relations	High level of child labour and forced labour at national level.	Construction	Potential discrimination against workers due to lack of implementation of HR policy and procedures.	Large Adverse (Significant)	Develop and implement a Labour Management and Monitoring Plan.	Minor Adverse (Not Significant)
		Operation	Potential forced labour risks and impacts within direct operations and supply chain.	Moderate Adverse (Significant)	<ul style="list-style-type: none"> Develop and implement a Labour Management and Monitoring Plan. Provide and implement a grievance mechanism for employees and any suppliers. Ensure employees and any suppliers have access to human resources policies. Ensure employees are aware of their rights to join local trade unions. Undertake independent audits and inspections. 	Minor Adverse (Not Significant)
Labour and Working Condition – Supply Chain Monitoring	Lack of consideration of social and labour aspects in management of supply chain.	Construction	Risks of forced labour and child labour in supply chain.	Large Adverse (Significant)	<ul style="list-style-type: none"> Develop and implement a Supply Chain Management Plan. Ensure that Project detailed design and construction tendering process includes clauses and policies on minimum working age, normal working hours, freedom to collective bargaining, good working conditions and eradicating risks of forced labour. Regular monitoring of suppliers. 	Minor Adverse (Not Significant)
		Operation		Moderate Adverse (Significant)	<ul style="list-style-type: none"> Develop and implement a Supply Chain Management Plan. 	Minor Adverse (Not Significant)
Occupational Health and Safety	AYGM manages occupational health and safety practices for the development and construction of	Construction	Common activities undertaken during construction can introduce high risks to the health and safety of the construction workforce, such as: the	Large Adverse (Significant)	<ul style="list-style-type: none"> Development of a Construction and Design Risk Register. 	Minor Adverse (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
	railways, ports, airports and logistics centres.		movement of machinery, demolition and excavation, electrical works, handling of chemicals, works undertaken at height. In particular, risks are more likely to be apparent for those who are not familiar with the type of works undertaken and/or the associated hazards.		<ul style="list-style-type: none"> Elaborate, implement and maintain the ESMP, to prepare the CESMP which will include: <ul style="list-style-type: none"> Health, Safety and Security Plan; Dust Management Plan; Construction Travel Plan; Construction Traffic Management Plan Tunnel Construction Plan; Lifting Operations Management Plan; and Risk Assessments and Method Statements. Elaborate the EMF to prepare the construction Emergency Response Plan. All construction activities will be completed in accordance with Government guidance relating to COVID-19. The applicable COVID-19 procedures will be detailed in the Health, Safety and Security Plan. 	
	TCDD Transport (and TCDD) manages occupational health and safety practices and conducts operational and maintenance (O&M) safety practices as part of railway operation in accordance with national legislation, guidelines, general orders, circulars and instructions.	Operation	Risks attributable to the operational phase associated with maintenance and inspection requirements. Maintenance and inspection will also require the use of site vehicles and activities that pose risks to human health and safety.	Significant Benefit	<ul style="list-style-type: none"> Elaborate, implement and maintain the ESMP to prepare the an OESMP, which will include: <ul style="list-style-type: none"> Health and Safety Plan; Railway Safety Plan; Operational Maintenance Plan; and Tunnel Operational Management Plan. Elaborate the EMF to prepare the operational Emergency Response Plan. Appoint an occupational safety specialist (or equivalent) 	Significant Benefit
Community Health, Safety and Security	The expropriation corridor will run across residential areas, properties, structures and agricultural lands.	Construction	Reduced safety and security of local families, women and children resulting from movement of construction workers in and out of the area.	Large Adverse (Significant)	<ul style="list-style-type: none"> Develop and implement a Health, Safety and Security Plan. Site security for the construction compounds. All construction areas will be surrounded by barricades with appropriate warning signs. 	Minor Adverse (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
					<ul style="list-style-type: none"> ■ The Contractor will ensure the works are planned to enable them to be delivered safely and, in a manner, which minimises congestion, road safety risks and disruption for all road users. ■ options relating to compensation for affected households due to any local nuisance or disturbance. ■ Clean all the public roads for spills and debris caused by the movement of vehicles and materials for the Project. ■ Any damage caused by these vehicles during the use of public roads will be repaired by in a timely manner. ■ Project grievance mechanism and CLOs (as detailed in the SEP). 	
	The Project will run across residential areas, properties, structures and agricultural lands.	Operation	Improved health, safety and security due to better facilities such as increased worker numbers and CCTV.	Moderate Beneficial (Significant)	<ul style="list-style-type: none"> ■ Develop and implement an Operational Health, Safety and Security Plan. <ul style="list-style-type: none"> • Development and implementation of a Labour Policy and Operational Workers' Code of Conduct, which will include measures to prevent any human rights violations (i.e. anti-social behaviour in relation to interaction with local community); • Training to security personnel on the Operational Workers' Code of Conduct; and • Community health, safety and security awareness measures. ■ On-going consultation with local communities to ensure any potential issues are addressed. ■ Provide and implement a grievance mechanism for the local community (as detailed in the SEP). 	Large Beneficial (Significant)
Community Access Rights	Residential areas, agricultural lands and farming activities and	Construction	The construction phase will include the use of machinery for excavation,	Large Adverse (Significant)	<ul style="list-style-type: none"> ■ Always enabling one-way traffic, where practicable. 	Minor Adverse (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
	businesses are important to local livelihood in rural areas.		significant ground works and the use of equipment. The presence of machinery, equipment and construction workers may provide obstacles and reduce the ability of local farmers and businesses to operate as normal.		<ul style="list-style-type: none"> Provide temporary roads around the construction areas, where necessary. Roadblocks will be provided to prevent access to the areas where construction activities are taking place. Construction of temporary vehicle bridges with sufficient capacity for the existing vehicle usage. Construction of temporary pedestrian bridges which will include appropriate safety measures. Provide signals and guardrails. Coordinate with local communities, neighbourhood Mukhtars and governorships on the development and location of temporary access roads and routes, as specified in the SEP. Users will be informed of any works which will affect access. <p>Disclosure of the timetable for movement of large construction vehicles.</p>	
		Operation	There is not expected to be a reduction in local access at the locations/areas where the Project is adjacent to the existing railway. The key areas which are anticipated to be affected and highly sensitive to reduced access are those locations where the alignment diverges from the existing railway, namely in Ömerli, Yeşilbayır and Bahşayış.	Minor Adverse (Not Significant)	<ul style="list-style-type: none"> Ensure that adverts are issued with details of the new underpasses and overpasses. Ensure that signage for the new underpasses and overpasses are displayed along the Project. Conduct regular consultation with affected users and communities. Ensure all the new underpasses and overpasses are maintained and inspected regularly for any potential damage, in accordance with the Operational Maintenance Plan. 	Minor Adverse (Not Significant)
Gender	High risk of GBVH incidents while using transport facilities. Significant gap in gender equality in employment, increased rate of GBVH during the COVID-19.	Construction	Reduced safety and security for local women and potential GBVH risks.	Large Adverse (Significant)	<ul style="list-style-type: none"> CLOs will undertake regular consultation with locally affected women on their concerns about the construction phase of the Project. Develop a Discrimination and Harassment Policy as part of AYGM's human resources policy and procedures. 	Minor Adverse (Not Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
					<ul style="list-style-type: none"> Develop a stand-alone Gender Equality and GBVH Action Plan, which will include training to project employees, suppliers and Contractors on GBVH associated risks. Promote open discussions about GBVH concerns through disclosure of gender awareness materials/training and implementation of effective Project and employee grievance mechanisms. Implement the Construction Workers' Code of Conduct, which will include measures relating gender equality and GBVH. Provide training to construction workers and sub-consultants. Raise awareness about gender and GBVH risks and the necessary actions for the security workforce. Promote and develop a mentoring programme for women in the construction workforce. Ensure inclusion and implementation of gender-responsive design features such as access for pregnant women and the disabled in diversion routes, assistance person, emergency hotline number, temporary footpaths, lightings. Develop STEM subject workshops for with local schools which are open to girls. Collaborate with local schools and universities to develop apprenticeship and graduate programmes which are open to women. AYGM and the Contractor will implement a zero-tolerance process for discrimination against women. 	
		Operation	Gender harassment at stations and on passenger trains, potential violence against women when walking to train	Minor Beneficial (Not Significant)	<ul style="list-style-type: none"> Ensure the maintenance of infrastructure and train facilities (in 	Moderate Beneficial (Significant)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
			stations to and from their place of residence particularly during night time, and discrimination against women rail workers such as drivers.		<p>accordance with the Operational Maintenance Plan).</p> <ul style="list-style-type: none"> A zero-tolerance process will be in place for discrimination. Allocate a dedicated person in the human resources department of TCDD Transport to deal with discrimination. Regular consultation with locally affected women. Implement an effective employee and public grievance mechanisms and provision of training on GBVH aspects to key responsible people. Develop STEM subject workshops with local schools which are open to girls. Collaborate with local schools and universities to develop apprenticeship and graduate programmes which are open to women. Promote and develop mentoring programme for women in the rail sector; and Provide transparency on pay to close gender pay gap. 	
Community Wellbeing	The Project area is a combination of rural areas and residential areas. There are residential areas within close distance to Project. Most households particularly in cities have good access to infrastructure.	Construction	Adverse impact on community wellbeing due to impact associated with noise, increase traffic and poor air quality.	Large Adverse (Significant)	<ul style="list-style-type: none"> Regular interaction of the CLO with the affected communities and nearby residential areas. 	Minor Adverse (Not Significant)
		Operation	Improved health, safety aspects and better transport facilities causing improved wellbeing.	Minor Beneficial (Not Significant)	<ul style="list-style-type: none"> Develop a programme of community initiatives and investment programmes. Ensure regular consultation with local communities to understand local wellbeing through facilitating workshops and community wellbeing focus groups at Mukhtar and province offices. 	Moderate Beneficial (Significant)
Rail Safety	<p>Average of 1.3 fatalities per million train km at national level.</p> <p>The existing railway is fairly typical of Turkish Railway existing</p>	Operation	The safety of the Project as currently designed would be significantly better than the existing average safety figure and therefore the passengers migrating	Significant Benefit	<ul style="list-style-type: none"> The detailed design will be developed to ensure compliance with the TSIs. It is proposed that further measures for safety management will be 	Significant Benefit

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
	infrastructure and therefore is likely to have about the average level of safety.		<p>from the existing railway to the Project would be safer</p> <p>The projected passengers some of whom would otherwise travel in their cars (or motorbikes), will also see a safety benefit since the safety of railways is generally much better than cars on a passenger km basis.</p> <p>Freight moving from road to rail will have increased safety.</p>		<p>incorporated into the Contractor Management Plan as follows:</p> <ul style="list-style-type: none"> • A Hazard Log. • A Railway Safety Plan. <p>■ A NoBo will be employed in order to verify compliance with the TSIs and an AsBo will be employed.</p>	
Major Accidents and Disasters³¹⁷						
Landslides	The Project alignment passes through several areas which have a risk from landslides, in particular chainages 42+000 and 51+000 pass through areas which contain old and active landslides. The Project involves the formation of deep cuts / high embankments.	Construction Operation	Workers Rail Users Public and Local Community	Not considered that the identified major event types could be currently managed to be 'As Low as Reasonably Practicable' (ALARP).	Mitigation measures associated with landslide risks during the construction and operation phases of the Project are described in Chapter 12: Geology and Hydrogeology .	Following the incorporation of the mitigation measures described in Section 16.8 of Chapter 16: Major Accidents and Disasters into the detailed design, then the risks would be anticipated to be as low as reasonably practicable.
Groundwater Flooding	<p>The Project is not located in a region that is at risk of floods.</p> <p>The design of rain collection and drainage systems has taken into account rainfall data.</p> <p>Groundwater seepage in tunnels this will require further consideration in the design, where underground tunnels are being proposed, e.g. – where the Project will cross underneath the proposed Kanal Istanbul project.</p>	Construction Operation	Workers Rail Users		Groundwater seepage into the tunnel under Kanal Istanbul (Tunnel 1) need to be considered and included in the design Risk Register so appropriate mitigation measures (such as waterproofing) are incorporated into the final design of the Project to avoid/minimise groundwater flooding.	
Cyclones, Hurricanes, Typhoons, Storms, Gales	The Project alignment is located in regions, in which the Marmara Transition Climate and Trakya Continental Climate are dominant.	Construction Operation	Properties Workers Rail Users		Mitigation measures associated with the risk of storms and gales during the construction and operation phases of the Project as described in Chapter 14: Climate Change .	

³¹⁷ By definition, a major event would have a major adverse effect on human health, property or the environment. Accordingly, any risks that could result in a major event without suitable mitigation, management or regulatory controls in place will be assessed as significant.

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	A fatal serious rail accident happened in 2018 (Corlu train derailment: a passenger train derailment occurred) due to heavy rainfall which affected the rail and railway sleepers related to a culvert, which resulted in 25 fatality on 8 July 2018 in the Corlu district of Tekirdag Province.		Public and Local Community			
Thunderstorms	The Project alignment is located in regions, in which the Marmara Transition Climate and Trakya Continental Climate are dominant.	Construction Operation	Workers Rail Users		Construction: When the use of temporary elevated structures is required during construction, working at height during storms will be ceased. As detailed in the CESMP . Operation: Lightning rod line will be established along with the overhead line system that will be used by the Project during operation.	
Extreme Temperatures: Heatwaves, Low (sub-zero) Temperatures and Heavy Snow	The Project alignment area experiences both a Mediterranean and humid subtropical climate. Summers are hot, humid and moderately dry whereas winters are cold and wet and sometimes snowy.	Construction Operation	Workers Rail Users Public and Local Community		Mitigation measures associated with the risk of extreme weather temperatures during the construction and operation phases of the Project as described in Chapter 14: Climate Change .	
Wildfires: Forest Fire, Bush/Brush, Pasture	Parts of the Project alignment (approximately 21km) would be located in, and be surrounded by, areas of forest (approximately 105ha) that could be at risk of wildfire events during hot, dry periods and/or fires initiated by construction related activities.	Construction	Ecological Receptors Properties Workers Road Users		Mitigation measures associated with the risk of wildfires during the construction and operation phases of the Project as described in Chapter 14: Climate Change .	
Poor Air Quality	-	Construction	Ecological Receptors Public and Local Communities Workers Road Users		Mitigation measures associated with the risk of increased poor local air quality during the construction and operation phases of the Project as described in Chapter 6: Air Quality .	
Plants	The risk remains that the Project may serve as a conduit to facilitate the establishment of new invasive species communities across the	Construction	Ecological Receptors Public and Local Communities Workers		Mitigation measures associated with the risk of substantial invasive plant outbreaks during the construction phase are described in Chapter 8:	

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	ecological zone of influence. Ozaslan et al. (2016) concluded ‘...that railways have notable contribution to plant invasion in Turkey’.				Ecology. These include the development and implementation of a Biodiversity Action Plan and Invasive Species Management Plan , as set out in the CESMP .	
Major Accident Hazard Chemical Sites	Letter no. 15590 dated 08/09/2015 of TPAO General Directorate specifies the distances to Natural Gas production wells to the Project: <ul style="list-style-type: none"> Within AR/TPO/I/4775 License Area: 520m distance to Kuleli-1 Well, 410m distance to Babaesli-2 Well, 240m distance to Babaesli-1 Well. Within D.Adatepe Operation License Area: 1,280m distance to D.Adatepe-5 Well. Within AR/TPO/I/4655 License Area: 1,110m distance to Kömürcüyolu-1 Well, 810m distance to Danamandıra-2 Well. The line passes through 4 Organised Industrial Zones (Tekirdağ Çerkezköy OIZ , Tekirdağ Ergene-1 OIZ, Tekirdağ Kapaklı OIZ, Kırklareli Evrensekiz Islah OIZ), which includes BEKRA establishments.	Construction	Rail Users Public and Local Communities		<p>Prior to construction, further details of the BEKRA sites needs to be obtained, including the distance from the Project to the installation located within 1 km either side of the Project and details of the consultation/safety zones around the installations that are subject to the BEKRA notification system. The impact of the Project on these installations and the impact of the installation on the Project needs to be evaluated and considered as part of the final design prior to construction.</p> <p>A Traffic Management Plan will be developed and implemented, as set out in the CESMP. This will ensure that emergency response units are able to get to site within the guideline response times.</p>	
Fires	The Project area is located in the 2 nd and 3 rd risk zones in terms of risk of fire.	Construction	Cultural Heritage Assets Public and Local Communities Road Users		The Emergency Response Framework specifies the need for equipment for reducing risk of fire, including evacuation strategy. Liaison with emergency services. Mandate use of fire reduction/ safety facilities.	
Road Transport Accidents	Currently TCDD is undertaking the following improvement works to the existing railway: the cross points of level crossings used by on-road vehicles; renewal of warning signs; and equipping the level crossings, which have high vehicle traffic and limited sight area, with safety systems such as automatic barrier, flange, camera and bell.	Construction Operation	Ecological Receptors Properties Workers Road Users		A Traffic Management Plan should be developed and implemented during construction.	

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	Reportedly, there have been installations of 632 signboards, 133 rubber material coatings, improvement works on 342 level crossings (arrangement of sight distance and access road, sign completion) and drawing warning lines for slowdown on 292 crossings were carried on 2018.					
Rail Transport Accidents	There are railways within the Project area, however this has low traffic flows and lower speed than that of the Proposed alignment. Accidents and incidents have occurred on the existing railway. In 2018, a total of 391 accidents were notified to the Transportation Safety Monitoring Centre and Directorate General of Railway Regulation (DDGM), 71 of which were considered as major accidents.	Construction Operation	Ecological Receptors Properties Workers Road Users		Mitigation measures associated with the risk of train accidents during the operation phase of the Project as described in Chapter 15: Social .	
Land Pollution Accidents	-	Construction	Ecological Receptors Cultural Heritage Assets Public and Local Community		Mitigation measures associated with the risk of pollution incidents to land during the construction of the Project as described in Chapter 12: Geology and Hydrogeology and in Chapter 8: Ecology .	
Water Pollution Accidents	-	Construction Operation	Public and Local Community Water Environment		Mitigation measures associated with the risk of pollution incidents to land during the construction and operation of the Project as described in Chapter 11: Surface Water .	
Electricity Utilities Failure	Underground and above-ground electrical transmission lines are present across the Project alignment, the responsibilities of which lie with the relevant local operator or company should this infrastructure fail.	Construction Operation	Public and Local Community Workers Rail Users		Mitigation measures associated with the risk of train accidents during the operation phase of the Project as Chapter 15: Social .	

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Tunnel Failure/Fire	The proposed alignment includes tunnels and underpasses.	Construction Operation	Workers Rail Users		Mitigation measures associated with the risk of train accidents during the operation phase of the Project as described in Chapter 15: Social .	