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4.3 Landscape and Visual Resources

4.3.1 Introduction

Landscape resources and character are considered to be of importance in their own right and are valued for their intrinsic qualities regardless of whether they are seen by people. Impacts on visual amenity as perceived by people are therefore clearly distinguished from, although closely linked to, impacts on landscape resources and character.

4.3.2 Study Area

The environmental baseline study area is shown in Figure 4.1.4; however, the identification of the study area for the assessment of landscape and visual impacts was further refined based on the recommendations contained in the UKs Landscape Institute and the Institute of Environmental Management and Assessment's guidelines[1], and reflects the extent of the Zone of Theoretical Visibility (ZTV), focusing upon the area within an approximately 15 km radius of the outermost components of the Project, but with reference to wider visibility where relevant (Figure 4.3.1).

4.3.3 Regional Topography

The RA covers an area of 29,800 km², with much of the country being mountainous. Elevations are usually greater than 1,500 m asl, rising to a maximum of 4,090 m asl (Mount Aragat).

The Amulsar Mountain deposit ridge is part of the Zangezur mountain range. The Zangezur range is characterised by jagged rock exposures rising above smoother, grass covered or forested mountains, which are separated by deep, steep sided gorges, and valleys cut by rivers, with post-glacial landforms being characteristic across the mountain range. The Zangezur range runs north-south and defines the border between the RA southern province of Syunik and Azerbaijan's Nakhichevan Autonomous Republic, to the west of Syunik. The southern axis of the mountains gradually rises to a maximum height of 3,906 m asl at the peak of Mount Kapoutjough.

[1] *Guidelines for Landscape and Visual Impact Assessment – Third Edition* (2013) Landscape Institute and Institute of Environmental Management and Assessment

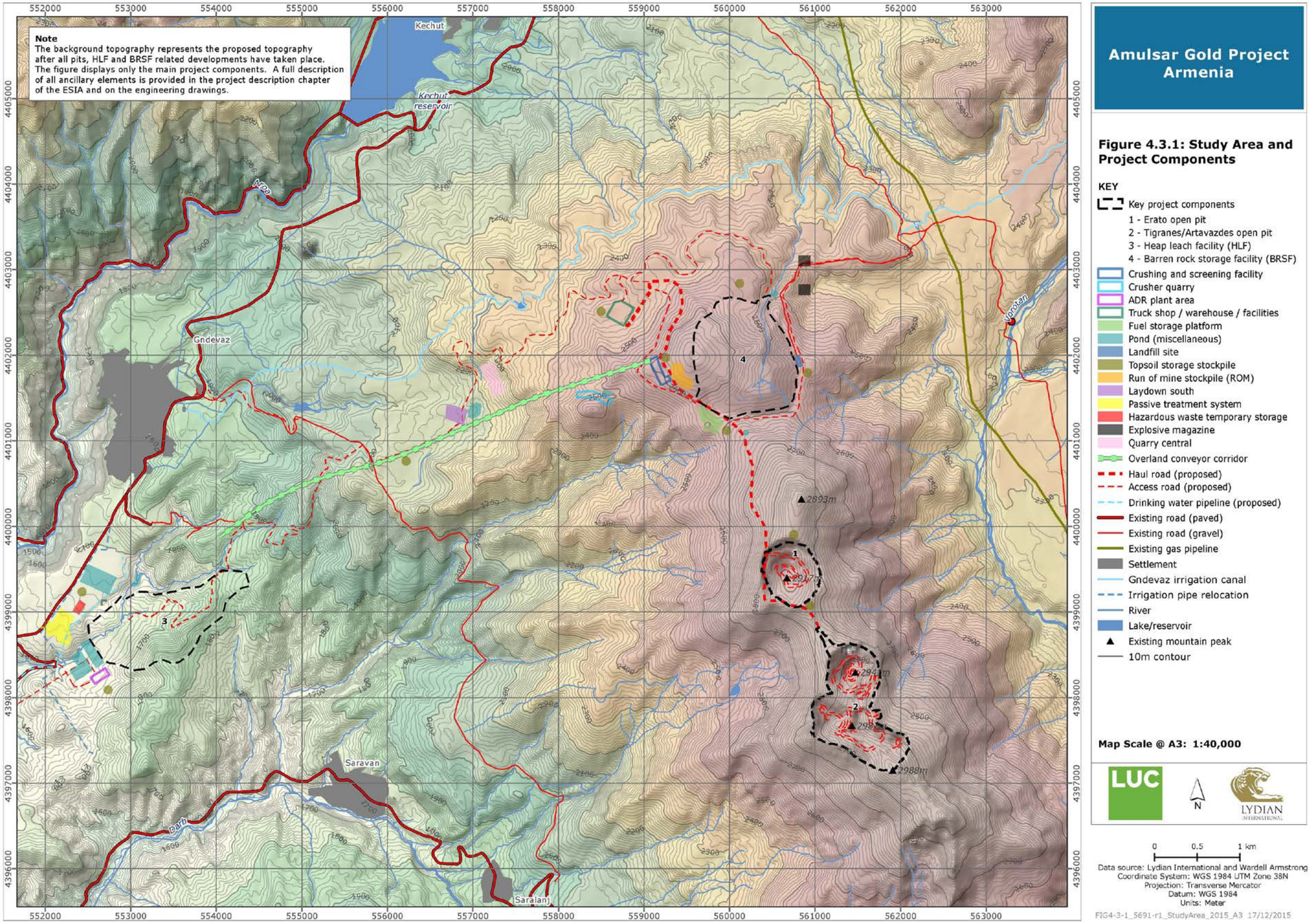


Figure 4.3.1: Study Area and Project Components

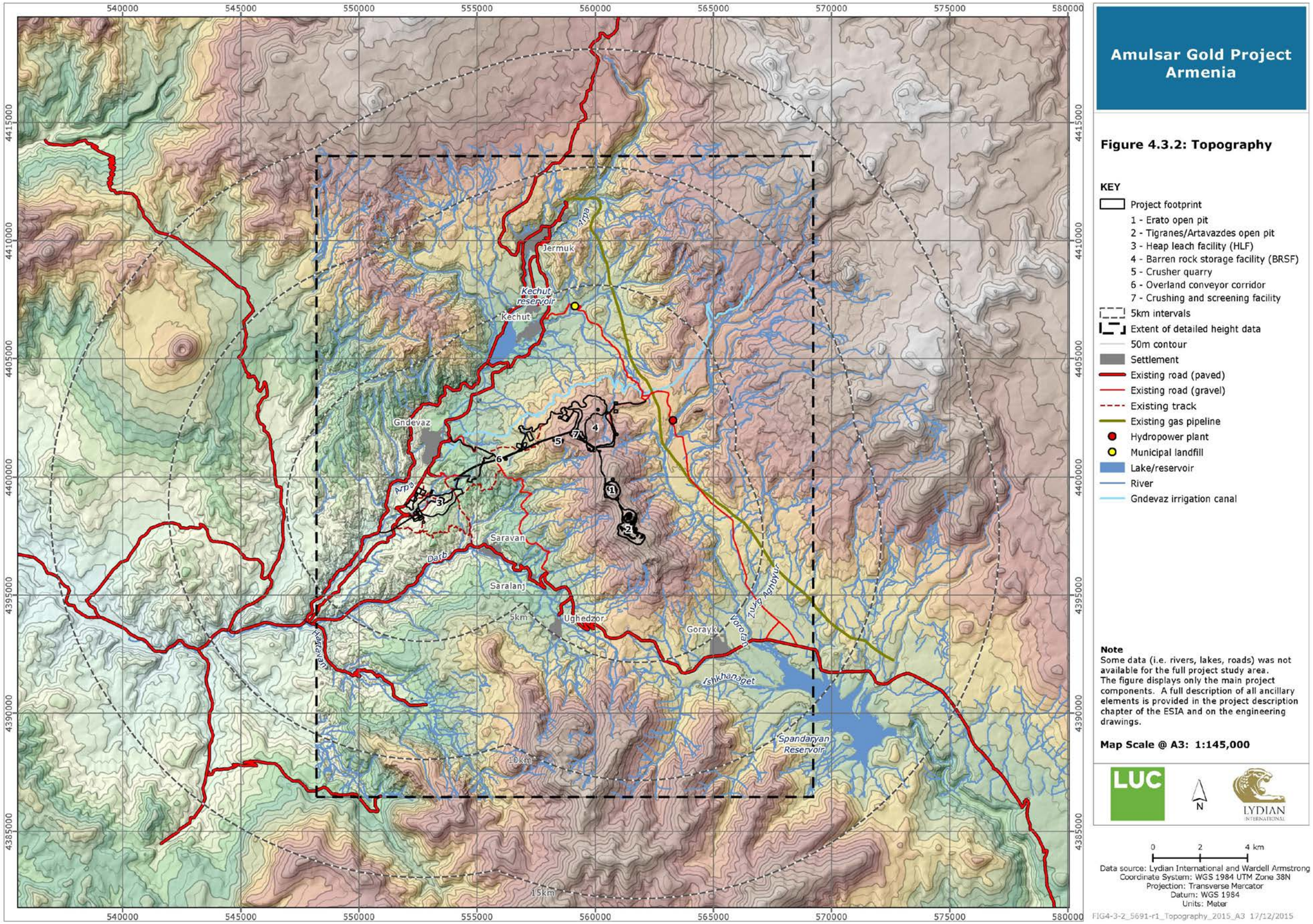


Figure 4.3.2: Topography

4.3.4 Local Topography

The general topography of the LVIA study area is shown onFigure 4.3.2, where the local landform is defined by a central ridge of rounded mountainous summits with craggy outcrops, which runs approximately 7 km north-west – south-east, and incorporates Amulsar, at a maximum elevation of 2,988 m asl. The ridge of mountains (collectively referred to as Amulsar Mountain), described here from north to south, comprises North Erato, Erato, Tigranes, Artavazdes and Arshak and forms a distinctive low-alpine zone with craggy outcrops and steep grass, rock and scree covered slopes, dropping to more gently sloping and rounded subsidiary hills. Large undulating grassy plateaus are dissected by a network of incised mountain stream tributary valleys, which flow into the broad, flat bottomed valley of the Vorotan River to the east, the watershed of the Spandaryan Reservoir to the south-east, and across gently undulating foothills and plateaus to the steep sided and scenic gorge of the Arpa River to the west and south-west. There is a watershed between Ughedzor and Gorayk, at the top of the Vorotan Pass (Syunik Gates).

Surface and drainage water from the mountainous Project Area flows into the river catchments of the Arpa, Darb (a tributary of the Arpa) and the Vorotan rivers, while feeding the large reservoir of Spandaryan to the east, a small irrigation pond above and to the east of Gndevaz, and the reservoir to the south of Kechut, on the Arpa River. The Darb and Arpa Rivers join near the junction of the M-2 and H-42 roads, to the south-west, from where the river flows west.

4.3.5 Topography and Landscape of the Project Area

The general topography of the Project Area is illustrated in Figure 4.3.1. The locations of the proposed key Project components are also shown on Figure 3.1, including the open pits of Erato, Tigranes and Artavazdes, the Heap Leach Facility (HLF), the Adsorption, Desorption and Recovery (ADR) Plant, the Barren Rock Storage Facility (BRSF), the crushing and screening facility, the overland conveyor and other components of mine infrastructure. These components are proposed at variable elevations within the Project licence area, from the pits located across the peaks of Amulsar Mountain to the HLF and ADR plant located on the lower foothills south-east of the settlement of Gndevaz. The topography and landscape in the area of each component part is described in the following sections.

Open Pits

The open pits will be located along the peaks of the Amulsar Mountain ridge (see Figure 3.1), centred on the summits of Erato, Tigranes and Artavazdes at elevations of approximately

2,917 m asl (Erato), and 2,941 m and 2,988 m asl (Tigranes and Artavazdes). The steep scree slopes are interspersed with craggy summits and stepped rock extrusions, with slope gradients upwards of 35% typical across the proposed open-pit areas. The open pits will be linked by haul roads, which contour around the western flanks of the mountain ridge. At this altitude, the vegetation is sparse and there is much bare rock. The peaks are snow covered for the majority of the year between November and April. There are seasonally used tracks across the lower areas of the mountains, but generally the slopes and summits have a natural appearance, and are used to an extent for summer grazing.

Plate 4.3.1: Site of Open Pits looking towards North Erato from the north – note the temporary exploratory tracks and drilling pads, now in the process of restoration.

Barren Rock Storage Facility

The Barren Rock Storage Facility (BRSF) will be located approximately 1.5 km north of the Erato open pit and 2.5 km west of the Vorotan River valley (at its closest point, see Figure 3.1). The BRSF site is a naturally enclosed, higher altitude mountain valley north of North Erato (approximately 2893 m asl), which forms the eastern and northern slopes of Little Erato (approximately 2660 m asl). The water catchment of the hanging valley flows to the north via a number of minor mountain streams, and eventually into the water catchment of the Arpa River to the north-west. The slope gradient within this valley is up to 40% in places and varies

in elevation between approximately 2450 m and 2660 m asl. The valley has several natural springs and seeps, with surface water flowing at its maximum in the spring, during seasonal snowmelt (April-June). Many of the BRSF site valley slopes exhibit a post-glacial terrain, with a land cover of grassland and herbs. Again, this area is typically snow covered for the majority of the year between November and April. The area is used for grazing in the summer months.

Plate 4.3.2: Site of Barren Rock Storage Facility (BRSF), from north of North Erato – note the temporary exploration camp located on the ridge east of the BRSF

Crushing and Screening Facility

The crushing and screening facility (primary and secondary crusher building and screening building) and associated infrastructure will be located on the western flanks of Little Erato, west of the BRSF which lies in the hanging valley on the eastern side of Little Erato (see Figure 3.1). The crushing and screening facility will occupy a footprint of 13.9 ha, and will be cut into the hill slopes at an elevation of between approximately 2580 m and 2610 m asl, and with gradients of up to 25%. The crushing and screening facility will be accessed via a haul road, extending from the open pits to the south-east contouring around the western flanks of the mountain ridge. The site of the crushing and screening facility is typically snow covered for the majority of the year between November and April.

Plate 4.3.3: Site of crushing and screening facility, looking west, south-west from the western flanks of Little Erato.

Overland Conveyor Corridor

The overland conveyor will link the crushing and screening facility with the HLF, proposed on the western foothills of Amulsar Mountain, for the purpose of carrying material in a broadly north-east to south-westerly direction (see Figure 3.1). The overland conveyor will start at the crushing and screening facility proposed on the western flanks of Little Erato and follow the broad ridge south-westerly in a roughly straight line to its termination at the truck load-out facility north of the HLF, from where material will be then be moved to the HLF via a haul road. The total length of the proposed overland conveyor is approximately 5.6km. The conveyor will be accompanied by an adjacent utility corridor including an access road for maintenance of the conveyor infrastructure. This west facing grass and scree covered mountain face tends to become free of snow in late April and early May each year, and to be snow covered again from around November. The land uses across this area include grazing of livestock, hay and food cropping, in addition to foraging for wild food.

Plate 4.3.4: Site of central section of Overland Conveyor route, looking south-west from the western flanks of Little Erato.

Plate 4.3.5: Site of lower section of Overland Conveyor route and HLF, looking west from the lower foothills of Amulsar Mountain.

Heap Leach Facility and Adsorption, Desorption and Recovery Plant

The Heap Leach Facility (HLF) will be located approximately 5 km west of the open pit of Erato and approximately 1.2 km south-east of the settlement of Gndevaz (see Figure 3.1). The footprint of the HLF will be within a broad and shallow hanging valley approximately 100 m lower in elevation than the settlement of Gndevaz and east of the Arpa Gorge. The HLF will lie to the east of the H-42 road (the main road to Jermuk) and will be approximately 100 m from the road at the closest point. The topography of the HLF site is defined by the main broad valley which runs broadly north-east to south-west towards the Arpa Gorge and H-42 road, and the smaller valleys of tributaries running south-west into the valley from the foothills of Amulsar Mountain to the east. As the valley reaches the H-42 road and edge of the Arpa Gorge, it narrows and its slopes steepen. The steeper slopes of the foothills to the east drop down to terraced areas of orchard, hay meadows and agricultural land used by the residents of Gndevaz, part of which is ploughed each spring. Some trees, including hawthorn and juniper along the valley are present, mainly in the more rocky areas along the streams, whose flow tends to be ephemeral, peaking during snow melt.

The accompanying Adsorption, Desorption and Recovery (ADR) Plant and contact water and storm water ponds are proposed approximately 2.5km to the south-south-east of Gndevaz at the most south-westerly point of the HLF site, and accessed from the H-42 road at the hairpin bend approximately 2.5 – 3 km south of Gndevaz. An existing electricity transmission line passes from north to south parallel with the H-42 road to the west of the HLF site. A number of additional minor elements of infrastructure are proposed to the west of the HLF alongside the H-42 road, including the passive treatment system and contact water ponds.

The area typically loses its snow cover during the second half of April, when it becomes green and flower-covered. Later in the year the landscape appears brown, as grasses become dried by the hot climate during the summer months at this altitude. The plateau west of the HLF is used for agriculture and is devoid of trees or dense vegetation, affording views towards the HLF site from the H-42 road.

Plate 4.3.6: Site of HLF and ADR Plant location, looking west from the lower foothills of Amulsar Mountain.

Designated Landscapes

The landscape of the LVIA study area is of local importance, with the landscape of the Project licence area not being covered by any international or national landscape designations. There are no areas of landscape within the LVIA study area which are designated for their scenic qualities or special landscape qualities, such as State Reserves or National Parks.

There are a number of Specially Protected Nature Areas, designated for their biodiversity conservation qualities and sensitivities in the LVIA study area. Although primarily designated for nature conservation, specific landscapes and landscape features can be directly linked to the reason for the protected status of such areas. The State Sanctuaries and the key landscape features which form a reason for their designation are outlined below:

- ***Herher Open Woodland State Sanctuary*** is protected for its areas of relict open yew woodland, and remnant pear orchards (established 1958, 6,139 ha) (5km west of the Project);
- ***Jermuk Hydrological State Sanctuary*** to protect Jermuk mineral water sources (established 2009, 17,371 ha) (6km north-west of the Project); and

- ***Jermuk Forest State Sanctuary*** is protected for its native oak woodland which provides vital habitat to a number of protected rare animals (established 1958, 3,865 ha) (6km north-west of the Project).

These State Sanctuaries are shown onFigure 4.3.5, and are described and considered in more detail within Section 4.10 Biodiversity.

Much further away, and not affected by the Project, is the Lake Sevan National Park (located approximately 44km north-north-west of the Project).

4.3.6 Landscape Character

Landscape is primarily concerned with the relationship and interaction between people and place. Landscape is defined by the *Guidelines for Landscape and Visual Impact Assessment*, as an area, which is perceived by people, the character of which is the result of natural and/or human factors. Different components of the environment, both natural (geology, soils, climate, flora, fauna) and cultural (historical, land use, settlement and other human intervention) combine to shape landscape character as perceived and related to by the people who experience it.

Given the absence of a published landscape character assessment for the area, the identification and definition of Landscape Character Types (LCTs) was undertaken, by professional landscape architects within LUC (Land Use Consultants Ltd.), considering topography, geology, soils, land cover, vegetation, land use, cultural and historical features (Figure 4.3.4). Each aspect was considered in drawing up a map showing a series of distinct, yet related, character types, by which the landscape can be categorised. The purpose of this characterisation process was to enable examination to be made of the potential impacts on each type of landscape which is present within the study area. Some landscape types are more sensitive or vulnerable to change than others, and each will respond in a different way, and require a different strategy in terms of mitigation and restoration.

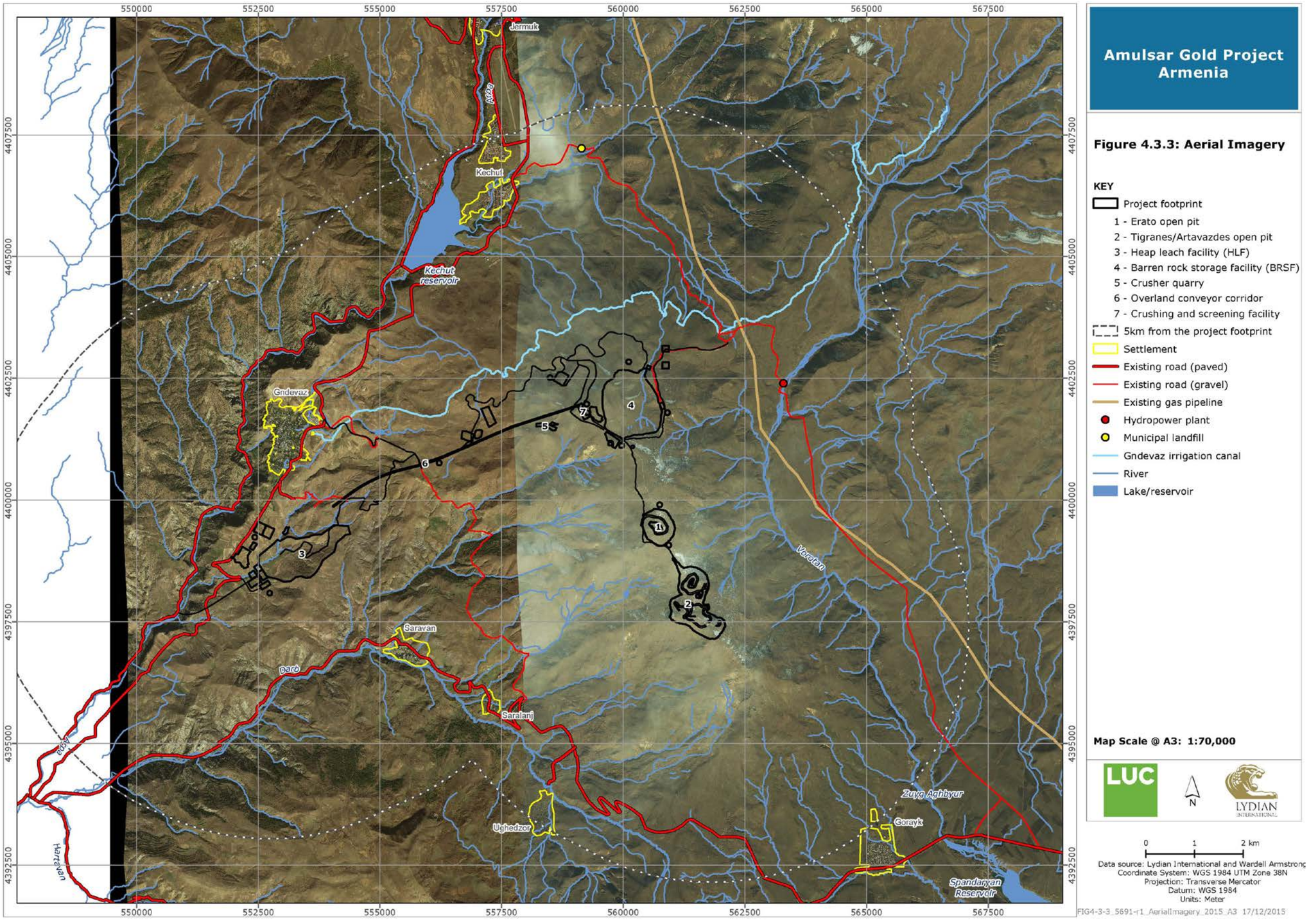
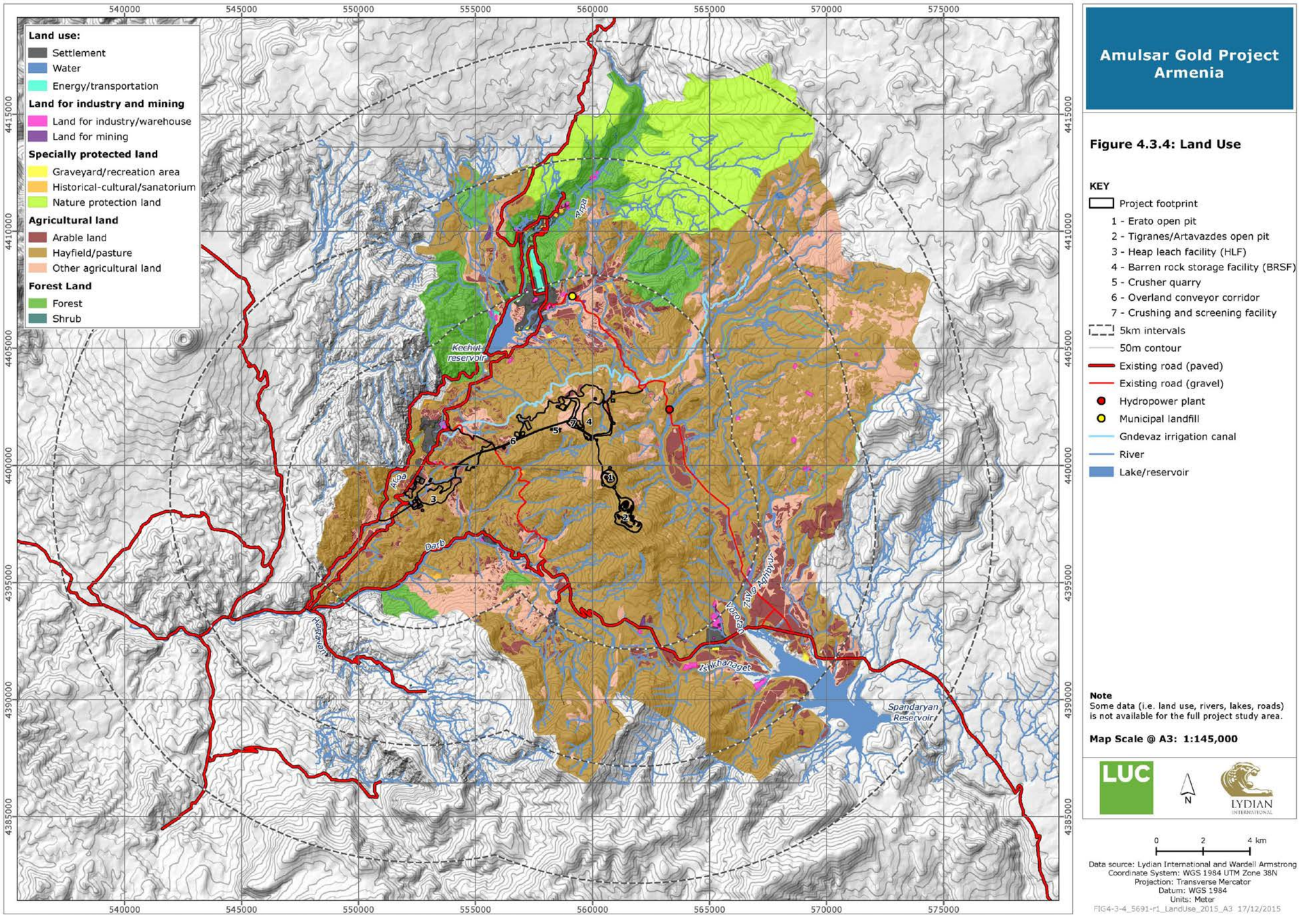


Figure 4.3.3: Aerial Imagery



Amulsar Gold Project
Armenia

Figure 4.3.4: Land Use

KEY

- Project footprint
- 1 - Erato open pit
- 2 - Tigranes/Artavazdes open pit
- 3 - Heap leach facility (HLF)
- 4 - Barren rock storage facility (BRSF)
- 5 - Crusher quarry
- 6 - Overland conveyor corridor
- 7 - Crushing and screening facility
- 5km intervals
- 50m contour
- Existing road (paved)
- Existing road (gravel)
- Hydropower plant
- Municipal landfill
- Gndevaz irrigation canal
- River
- Lake/reservoir

Note
Some data (i.e. land use, rivers, lakes, roads) is not available for the full project study area.

Map Scale @ A3: 1:145,000

N

0 2 4 km

Data source: Lydian International and Wardell Armstrong
Coordinate System: WGS 1984 UTM Zone 38N
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter
FIG4-3-4_5691-r1_LandUse_2015_A3 17/12/2015

Figure 4.3.4: Land Use

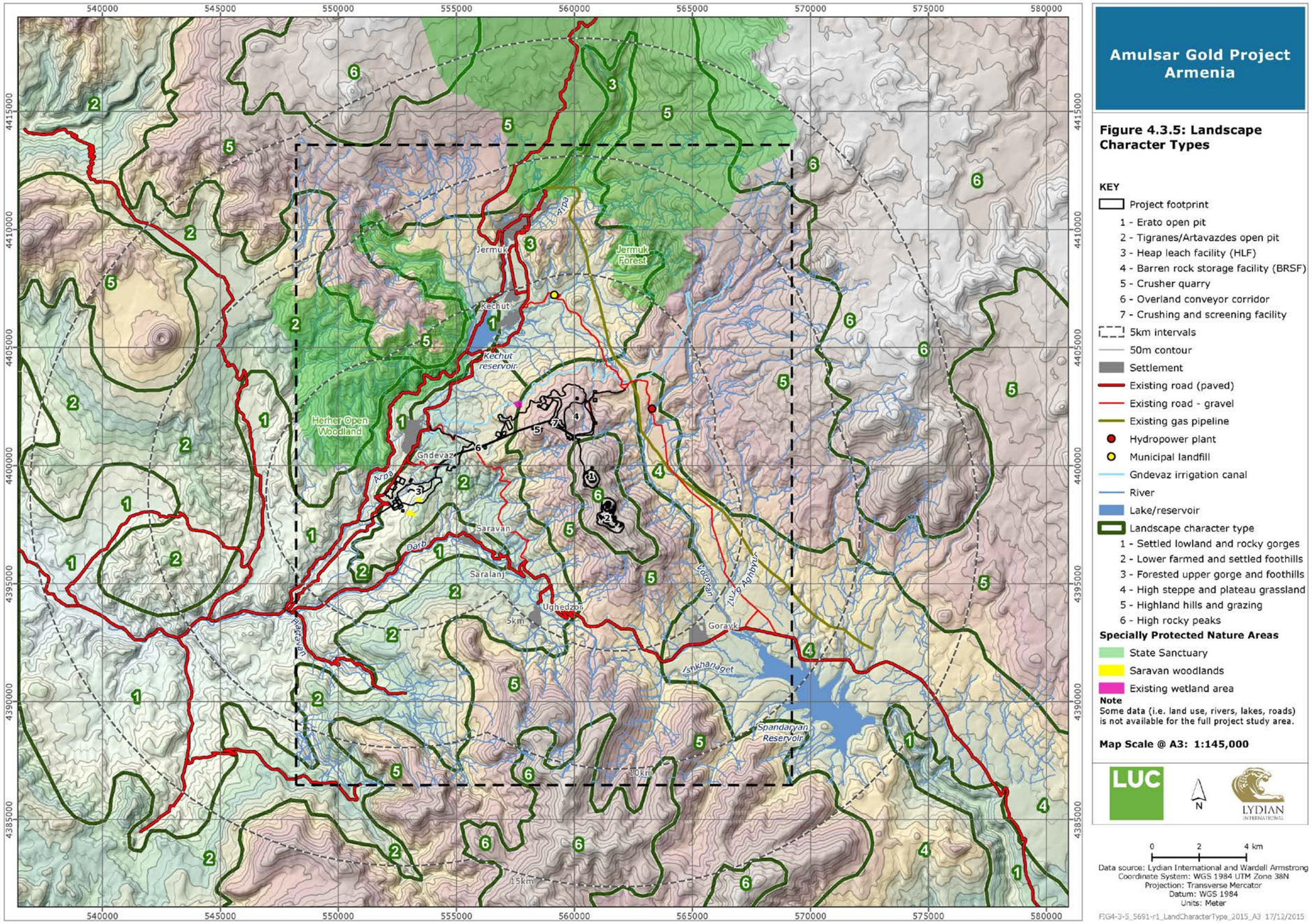


Figure 4.3.5: Landscape Character Types

The descriptions of the LCTs should be read with reference to the additional detailed baseline information provided in Section 4.7 Soils and Land Cover and Section 4.10 Biodiversity.

Cultural heritage and archaeological interests have been identified within the Project Area and are considered in more detail in Section 4.19 Archaeology and Cultural Heritage, however the historical and cultural human influence on landscape change was considered in terms of the development of the present landscape character of the study area.

Landscape Character Types (LCTs)

In order to understand the underlying landscape, six broad landscape character types are described, taking account of both the natural and cultural components which contribute to the landscape. These were defined following desk based study of the baseline information outlined above, along with examination of maps showing topography and land uses, and aerial imagery data. The LCTs were verified and refined further following field visits in early April and early June 2013 (Figure 4.3.5). The six broad character types are listed below:

- Settled Lowland and Rocky Gorges (generally found at elevations below 2,000 m asl);
- Lower Farmed and Settled Foothills (generally found at elevations of 2,000 - 2,300 m asl);
- Forested Upper Gorge and Foothills (generally found at elevations of 2,300 - 2,500 m asl);
- High Steppe and Plateau Grassland (generally found at elevations of 2,000 - 2,300 m asl);
- Highland Hills and Grazing (generally found at elevations of 2,300 - 2,700 m asl); and
- High Rocky Peaks (generally found at elevations over 2,700 m asl).

The geographical distribution and key defining characteristics of each landscape character type is described in detail in Table 4.3.1 to Table 4.3.6 below:

Table 4.3.1: Settled Lowland and Rocky Gorges (generally found below 2,000 m asl)
Settled Lowland and Rocky Gorges **Description:** This LCT, with river gorges enclosed by basalt cliffs and steep slopes, rises from the lowland and the lower valley bottoms, via steep sided gorges, to the edges of and including farmed plateaus above. The gorges are frequently used for road corridors, and are associated with a low density string of human settlement and activity. They are frequently very scenic, with picnic areas and occasional tourist facilities such as restaurants, focused on the fast flowing rocky rivers contained within them. **Key Characteristics:** • Alternate natural and cultivated valley and gorge bottoms, often the focus of transport routes;

- Presence of linear and vertical features, including road corridors, and pylons;
- Partly wooded, with species such as willow, juniper, and areas of cultivated fruit trees, or with wooded sides including juniper, and very sheltered;
- Long distance and usually glimpsed or framed views from valleys and gorges to summits and ridges high above;
- Sense of human influence, but also often highly scenic, with inaccessible basalt cliffs being unaffected by human activities;
- Tourist facilities such as picnic areas, associated with the attraction of fast flowing rocky rivers.

Geographical Extent within Study Area:
This landscape character type is present west of the study area but would not include any of the proposed components, extending to just west of the most westerly components of the Project (the ADR plant and HLF) proposed to the east of the H-42 road, south of Gndevaz. The LCT is widespread across the lower areas of valleys and gorges to the west and south-west of the study area, associated with the watershed of the Arpa and Darb rivers. The landscape type is also found beyond 15 km from the Project, downstream of the Spandaryan Reservoir to the south-east.

Sensitivity to Landscape Change:
Sensitive to the alteration or loss of the scenic qualities of the gorge landscape which attracts visitors and tourists. The presence of man-made features within the landscape character type is common, with linear development focused along road routes, although this landscape is also sensitive to further manmade development. Glimpsed and often framed views to surrounding upland summits and ridges are widely available, these views also being sensitive to change.

The **Herher Open Woodland State Sanctuary – Specially Protected Nature Area** is partly found within this landscape type to the west of the Arpa Gorge. It is protected for its areas of relict open yew woodland and remnant pear orchards.

Table 4.3.2: Lower Farmed and Settled Foothills (generally found 2,000 m - 2300 asl)

Lower Farmed and Settled Foothills

Description:

This landscape character type extends across a varied topography, including broad valleys and plateau to the west and south-west and gentle slopes which form the foothills of surrounding hills and mountains. This landscape type has a predominant land use of pasture, with areas of arable and hay fields across the gentle slopes to the west of Amulsar Mountain, and areas of forest across the steeper slopes surrounding Kechut Reservoir to the north-west and the Herher Open Woodland, west of the Arpa River Gorge. The landscape displays human influences, including the upper parts of the settlements of Gndevaz, Saralanj and Ughedzor. The presence of built elements is widespread within parts of this landscape, including pylons and masts which serve as detractors. The Armenian Silk Road (M2 Road) to Iran also passes through this landscape. Quarries and borrow pits, and small-scale adits and mines are also found on the slopes of the foothills across this landscape type, as evident near Saravan.

Key Characteristics:

- Settled landscape with agricultural villages, roads and industrial remnants;
- Pasture used for grazing, low intensity arable and hay fields across mountain meadows;
- Presence of linear and vertical features, including roads, masts and pylons which serve as detractors;
- Forested steep slopes and wooded gorges to the west (Herher Open Woodland) where juniper woodland is highly characteristic;
- Views from open foothills to summits and ridges and down to lowland valleys;
- Sense of human influence throughout the landscape;
- A large scale, open and extensive landscape from which people can experience open views of the surrounding upland landscape.

Geographical Extent within Study Area:

This landscape character type is present within the study area, with some of the most westerly components of the Project (the ADR plant, HLF and overland conveyor) proposed within this landscape type where it occurs between the Arpa Gorge to the west and Amulsar Mountain to the east. This landscape type extends over the lower western foothills of Amulsar Mountain, southwards to the highpoint of the Vorotan Pass, and the watershed of the Darb River. This landscape type also characterizes the lower slopes of the foothills west of the Arpa River gorge, and areas to the north of the Darb River, above Saravan.

Sensitivity to Landscape Change:

The landscape character type has been subject to areas of extensive landscape change and human influence, which varies throughout this landscape with sensitivities to further development varying. The valley of the Arpa River and the area around Gndevaz is a focus for development. Widespread and panoramic views from this open landscape to the higher summits and ridges are frequently seen, across open plateau and broad river valleys, and are experienced by people concentrated within or travelling through this landscape.

The **Herher Open Woodland State Sanctuary – Specially Protected Nature Area** predominantly encompasses this landscape type, to the west of the Arpa Gorge, extending into adjacent landscape types. It is protected for its areas of relict open yew woodland and remnant pear orchards.

Table 4.3.3: Forested Upper Gorge and Foothills (generally found 2,000 - 2,300 m asl)

Forested Upper Gorge and Foothills

Description:

This landscape character type extends across a varied topography, including broad upper valleys and sub-alpine meadows around Jermuk, the wooded river gorge of the Arpa River and the foothills above it. This landscape has a mixed land use of forested hillslopes, characterized by dense areas of stunted oak and grazed meadows, with areas of arable and hay fields across the areas surrounding the settlements of Kechut and Jermuk. It is being proposed to create a National park including the existing State Sanctuaries which incorporate the forest across the steeper slopes surrounding the Kechut Reservoir and the Jermuk valley in the north of the study area. This landscape displays a multitude of human influences, including the settlements of Jermuk and Kechut. The presence of built elements is extensive within the landscape character type, including pylons and masts which serve as detractors, as does open landfill known as the Kechut landfill. Kechut Reservoir, the disused Jermuk airstrip and the Jermuk ski slope are located within this landscape type.

Key Characteristics:

- Settled landscape with villages and towns, roads, reservoirs and industrial remnants;
- Areas of tourist and recreational interest located around Jermuk;
- Pasture used for grazing, low intensity arable and hay fields across grassland and shrub areas, with pockets of wetland vegetation;
- Presence of linear and vertical features, including roads, masts and pylons which serve as detractors: strong sense of human influence throughout the landscape character type;
- Steep forested slopes and wooded gorges to the north (Jermuk Forest Park), where dense oak woodland is highly characteristic;
- Areas within wooded gorges have a sense of shelter and enclosure;
- A landscape from which people can experience open views of the surrounding upland landscape: views from open foothills to summits and ridges and down lowland valleys.

Geographical Extent within Study Area:

This landscape character type is not present within the central core of the study area, however the existing access track from the H-42 road near Kechut passes through this landscape. This landscape is widespread across the slopes of the north Arpa River and sub-alpine meadow areas of valley plateau to the north of Amulsar Mountain.

Sensitivity to Landscape Change:

Areas of this landscape character type have been subject to extensive landscape change and human influence, which varies throughout the landscape character type. The northern valley of the Arpa River is a focus for development, and the likely location of future built development and expansion of the settlement of Jermuk. Views from this landscape are seen to the higher summits and ridges, across open plateau and elevated slopes on the edge of the landscape character type, and are experienced by people concentrated within or travelling through this landscape character type. Such views are sensitive to change. This landscape would also be sensitive to loss of the oak woodland which is one of its defining features.

The **Jermuk State Sanctuary – Specially Protected Nature Area** is partially encompassed within this landscape type and is sensitive to direct landscape change, given the presence of highly characteristic native oak woodland across the area.

Table 4.3.4: High Steppe and Plateau Grassland (generally found 2,000 - 2,300 m asl)

High Steppe and Plateau Grassland

Description:

This landscape character type is characterized by very open, grazed steppe and pastures which occupy areas of predominantly flat or more gently sloping plateau below the rocky peaks and highland hills, and above the rocky gorges of the study area. It is a landscape dominated by extensive steppe vegetation, with areas of grassland dissected by rivers and streams draining the steeper mountain slopes above. Settlement is found along the roads, but the higher edges of this landscape type, where it blends into the highland slopes and hills above, are largely unpopulated, except by seasonal herders. This steppe landscape lies on the lower edge of the sub-alpine zone. It is extensively used for the seasonal herding of grazing cattle, sheep and goats, and foraging for herbs and mushrooms, with some small-scale arable fields nearer to settlements. The settlements of Gorayk and Tsghuk are located along the route of the Armenian Silk Road (M-2 road) near Spandaryan Reservoir, which runs across this large scale, extensive steppe and plateau landscape to the south-east of the study area. This landscape is continuous with and includes the relatively flat land which extends up the Vorotan valley, east of Amulsar Mountain.

Key Characteristics:

- Flat or undulating meadow and steppe, crossed by streams and rivers flowing from the highlands above;
- Extensive areas of unenclosed open grazing grassland with pockets of wetland vegetation, rising to mountain meadow steppe on its upper fringes;
- Settlement concentrated along the route of the M-2 road to the south and west;
- Minimal human influence away from the main road corridors and the large man-made Spandaryan Reservoir: presence of some built features including gas pipeline, pylons and masts;
- Sense of vastness, openness, perceived naturalness and solitude;
- Lack of tree cover and variation of vegetation cover;
- Long distance views to rocky peaks forming focal points.

Geographical Extent within Study Area:

This landscape character type is not present within the Project disturbed and restricted areas (see Figure 4.1.6), however several components of the Project are proposed close to this landscape, which extends across the floor of the Vorotan valley, and south across the plateau surrounding Spandaryan Reservoir and the foot of Vorotan Pass around Gorayk.

Sensitivity to Landscape Change:

Due to the relatively undeveloped nature of the northern extent of this landscape (with the exception of an unsurfaced road up the Vorotan valley, and a small hydro-electric dam), it is considered sensitive to the introduction of large scale development which will lead to substantial changes in land cover and landform. Although existing development exists within the southern extents of the area, this is predominantly concentrated close to the M-2 road and Spandaryan Reservoir and does not substantially detract from the sense of openness and perceived naturalness of the surrounding landscape. Changes to distant peaks forming focal points may be perceptible from this open landscape.

Table 4.3.5: Highland Hills and Grazing (generally found 2,300 - 2,700 m asl)

Highland Hills and Grazing

Description:

This landscape character type covers the steep sloping sub-alpine zone and forms the transitional zone between the widespread lower mountain foothills, or steppe plateau below, and the low alpine zone of the rocky peaks and high plateau which are found at higher altitudes, above these hills. These highland hills have areas with shallow soils, and there are rocky outcrops at higher altitudes, with scree found on steeper slopes, dropping to mountain streams which drain the high rocky peaks above. The landscape is used for the seasonal herding of grazing sheep, goats and cattle, and foraging for herbs and mushrooms. Extensive areas of forest extend across areas of the landscape character type to the northern extent of the study area, but the highland hills around the Project disturbed area are generally lacking in trees, with grass and low herbs, or prostrate alpine shrubs being the prevailing vegetation types.

Key Characteristics:

- Steep upland slopes of highland summits;
- Sub-alpine meadows with evidence of seasonal herding and shepherding, with remnant shepherd huts and animal enclosures;
- Large scale, extensive, open and unenclosed landscape;
- Unsettled, with an absence of human influence and built features;
- Sense of altitude, remoteness and relative wildness;
- Expansive outlook and views down to and across the surrounding landscape;
- General lack of tree cover within Project disturbed area, and a low or absent vegetation cover;
- Snow covered for 6 months of the year, resulting in sub-alpine vegetation.

Geographical Extent within Study Area:

This landscape character type is present within the Project disturbed area with several components of the Project proposed within this type of landscape. The landscape covers the upland slopes of the Amulsar Mountain and the rounded summit of Little Erato to the north of Amulsar Mountain. Across the study area, the landscape character type also extends across the sub-alpine zone of the Zangezur Mountain range to the north, north-east and south of the Project area.

Sensitivity to Landscape Change:

Visibility of the rocky peaks and ridges above this landscape is characteristic, and as such this landscape would be sensitive to development which will change these views and the sense of remoteness and relative wildness. The sub-alpine mountain vegetation is sensitive to change, as the long period of snow cover means growth rates are slow.

The Jermuk State Sanctuary – Specially Protected Nature Area is predominantly encompassed within this landscape type, and is sensitive to direct landscape change, given the presence of highly characteristic native oak woodland across the area.

Table 4.3.6: High Rocky Peaks (generally found over 2,700 m asl)
High Rocky Peaks **Description:** This landscape character type includes the rocky peaks, and in the wider area the high alpine plateaus, of the low alpine landscape found across the mountain summits of the Zangezur Mountain range. Generally found above 2700 m asl, the summits and skyline ridges consist of volcanic rock extrusions and scree slopes with shallow soils and limited alpine vegetation cover. The rocky summits and peaks form the visible skyline from the surrounding landscape, and represent identifiable landmarks from the lower lying valley landscape below. The landscape displays few signs of human influence, with shepherding of sheep and goats found on the lower slopes in spring and summer. **Key Characteristics:** • Rocky summits and outcrops, with steep slopes, bare ground and areas of scree; • Sub-alpine meadow vegetation and areas of sub-alpine meadow with alpine elements; • A large scale, dramatic, open and unenclosed landscape; • Unsettled with an absence of human influence and built features; • Sense of altitude, exposure, remoteness and relative wildness; • Expansive outlook and panoramic views across the surrounding landscape; • Landmark summits which are locally and regionally recognised. • Snow covered for 6 months of the year. **Geographical Extent within Study Area:** This landscape character type covers a small area of the Project disturbed area and a relatively small proportion of the study area, although it is more widespread further north and south. The linear ridge of summits formed by North Erato, Erato, Tigranes and Artavazdes define the landscape character type within the Project disturbed area, which extends southwards to cover the summit of the subsidiary peak of Arshak to the south. This landscape type is also found across the higher mountain summits of the Zangezur Mountain range to the north-east, south and north-west of the Project disturbed area, at approximately 10km from Amulsar Mountain. **Sensitivity to Landscape Change:** The rocky peaks and ridges of the landscape character type are sensitive to visually intrusive development which could detract from the distinct physical landmarks of the summits, or cause loss of the low alpine landscape. The perceptual qualities of exposure, remoteness and wildness are sensitive to direct landscape change or intervisibility of development within the adjacent landscape. The **Jermuk State Sanctuary – Specially Protected Nature Area** is partly encompassed within this landscape type and is sensitive to direct landscape change, given the presence of highly characteristic native oak woodland across the area.

4.3.7 Visual Amenity

Establishing the visual baseline for the assessment of visual impacts involves three stages:

- Identifying the extent of visual influence of the Project, and the component parts of the Project;
- Identifying the potential visual receptors (groups of people) who may experience views of the Project;
- Establishing representative viewpoints from which receptors will potentially experience views of the Project.

The process of identifying the visual baseline was undertaken with reference to early iterations of the Project design, when visibility of the Project was more extensive, thus representing a maximum case scenario. As the Project evolved, the visual baseline has been updated to reflect modifications to the Project design as a result of the iterative design process and the mitigation which, as such, is embedded within the design.

Identifying the extent of visibility

Evaluation of the theoretical extent to which the Project will be visible across the study area was undertaken by establishing a series of Zone of Theoretical Visibility (ZTV) maps, using computer software capable of calculating intervisibility between points within the terrain model and components of the Project, created within the model.

Computer software (Arc GIS) was used to generate the ZTVs. The programme calculates areas from which the Project components are potentially visible. This is performed on a 'bare ground' computer generated terrain model, which does not take account of potential screening by minor topography (i.e. that below the resolution of the data), buildings or filtering of views by vegetation. The input parameters used were a 50m x 50m grid which means that for each 50m grid point the computer outputs 'visible' or 'not visible' (+1 and -1 values respectively). The receptor grid points used were set at 2m above ground level, as a proxy for human eye height. The +1 and -1 output values are plotted as contours and overlaid onto the base map to illustrate the extent of the ZTV. It should be noted that the programme uses point height data, rather than continuous data, and assumes straight line topography between data points. The software is not able therefore to take account of small scale topographic features. As it uses a 'bare ground' model, it is considered to over emphasise the extent of potential visibility, and therefore represents the maximum potential visibility.

Further ZTVs were generated throughout the iterative Project design process to establish the changing extent of theoretical visibility, identify potential visual receptors indicated within the ZTV and to identify representative viewpoints located within the ZTV.

Identifying Potential Visual Receptors

The following visual receptors were identified during initial desk based study and field visits and were refined throughout the Project design process as the extent of visibility changed:

- Residential receptors including people concentrated within affected communities and in more scattered dwellings;
- Tourists and visitors to the area;
- Recreational receptors using the area, such as the ski-slope in Jermuk;
- People travelling on roads, tracks and paths through the study area including major and minor roads; and
- People at their place of work: including seasonal herders and subsistence farmers.

Identifying Potential Representative Viewpoints

A large number of potential representative viewpoint locations were identified throughout the iterative design process, which were refined as modifications to the Project design were incorporated. The final representative viewpoints used for the assessment of visual impacts were chosen according to the following criteria:

- Being publicly accessible;
- Having a reasonably high potential number of receptors or being of particular importance to the viewers affected;
- Providing a representative range of viewing distances, directions and elevations (short, medium and long distance views);
- Representing a range of viewing experiences (static views, views from settlements and sequential points along routes);
- Representing a range of view types, (panoramas, vistas, glimpses); and
- Representing views with different parts of the Project potentially being visible.

The representative viewpoints are all located within area of theoretical visibility indicated on the final ZTVs, and locations with the clearest views of the Project have been selected. These are listed and their locations shown on maps in Section 6.5. Existing and proposed views across the study area and from each of the representative assessment viewpoints are also described and illustrated in Section 6.5.