



## **Nature and Parks Authority**

Science Division

Document submitted to the Northern National Planning Committee and to the National transport infrastructure company in order to convince them of the importance of constructing a wildlife overpass over road No. 71

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### **Wildlife Overpass on Road 71, Harod Valley**

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*Note: It is recommended to read the document enlarged 130% in order to see the details of the attached maps.*

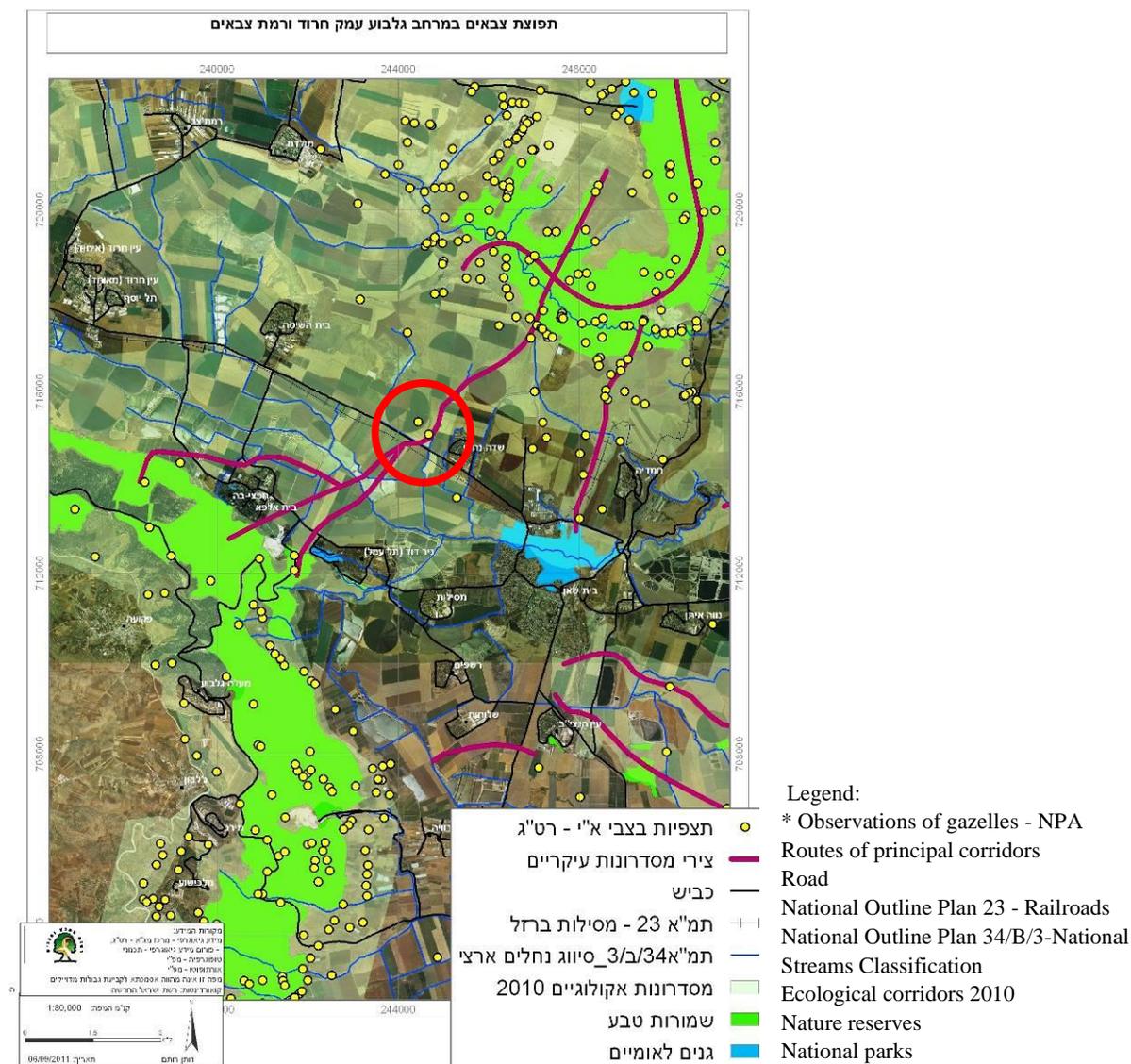
This document discusses the importance and need to construct a wildlife overpass over National Road 71 which is about to be widened. From a 2-lane road without median separator it will become a 4-lane road with a median concrete separator – "New Jersey". This will prevent wildlife from crossing the road almost entirely and will constitute a barrier for animals which will not use underpasses that have been lengthened to about 100 meters.

In the north of Israel there is an elongated topographical depression in a general west-east direction, consisting of four valleys - Zevulun, Jezreel, Harod and Beit She'an. This continuity creates a break between the chalky hills of the Lower Galilee to the north, and those comprising the central hill range of Gilboa, Shomron, Ramot Menashe, and separately - the Carmel. The topographical structure of the valleys is a shallow depression in relation to the surrounding areas, which is drained by two main streams. The Harod Valley is drained eastward towards the Beit She'an Valley by the Harod Stream, while the Jezreel and Zevulun Valleys are drained westward by the Kishon River. In both cases the area is relatively flat, inclining eastward and westward respectively. The roads and railroads, in both the distant and recent past, as well as in the present, are constructed in the more moderate regions enabling rapid and inexpensive construction, which exploits the topography. The level topography and the relatively shallow drainage system on this plain area also dictate relatively low water conduits and there is almost no need for bridges as required for building roads passing through mountainous areas.

Ecologically, the Gilboa and Ramot Yissachar hills create unique and rare ecosystems - bushy and grassy Batha. These ecosystems are very rich (highly diverse) in plant and animal species, and in this region can be found desert and sub-tropical characteristics reaching northward along the Dead Sea Valley, and it is the meeting place of Mediterranean and Irano-Turanian species. For instance: two species of "Jujube" - *Ziziphus spina-christi* (Christ's crown of thorn jujube) - the subtropical-sudanodecanic species, and *Ziziphus lotus* - the Irano-Turanian species, grow here side by side. Studies

have located species such as the poppy-leaved reichardia (*Reichardia tingitana*), typical of more desert-like regions. Among the fauna, the painted carpet viper (*Echis coloratus*) and the black mole viper (*Atractaspis engaddensis*) can be noted as southern and tropical species for which this region is their northernmost distribution. In general this region has a rich diversity of reptile species. The combination of water areas in the Harod Valley, including fish ponds and the Harod Stream itself and the many springs, attracts a broad diversity of mammals, among them the Indian porcupine (*Hystrix indica*), the swamp lynx (*Felis chaus*), the rare European otter (*Lutra Lutra*) as well as wolves, hyenas and others (Rotem 2009 A and B; Skotalsky 2009; Sinai & Ben-Yosef 2004; Porat 2010). But the most typical species in all grassy and bushy ecosystems is the Mountain gazelle (*Gazella Gazella Gazella*), which also serves as the flag species for the conservation of these important ecosystems. According to studies conducted over the last two decades (Sinai, Shreiber & Ben-Yosef 2010; Kaplan 2009; Skotalsky 2009), the largest population of gazelles in Israel and in fact in the entire Middle East (actually in the whole world) can be found on both sides of the Harod Valley - Gilboa and Ramot Yissaschar.

From an analysis of random observations and regular counts of mammals, conducted by the Nature and Parks Authority in these regions, it can be seen that the gazelle is observed mainly in the natural grassy habitats remaining on the rocky slopes facing the streams in the region of Ramot Yissaschar and Ramat Tzeva'im, and on Mt. Gilboa they are found more in habitats constituting a significant part of its eastern area (Figure 1). Today, due to agricultural development, settlements and extensive infrastructure in the Harod and Beit She'an Valleys, almost no more natural continuous passages remain between Mt. Gilboa and Ramat Tzeva'im and Ramot Yissaschar. Most of the connectivity is based on narrow streams, drainage channels and natural verges in the midst of cultivated areas (Kaplan & Witman, 2010). These remnants are separated from one another by agricultural fields. Nevertheless, it can be seen from the concentration of observations collected by the Nature and Parks Authority rangers that gazelles have been observed in the midst of the agricultural areas and even close to Road 71 that traverses the Valley and constitutes a certain obstacle for their crossing (Figure 1). It is important to note that gazelles do not refrain from entering agricultural fields to eat or to cross the region, but by doing so they are more exposed to predation or hunting (Illustration 1).



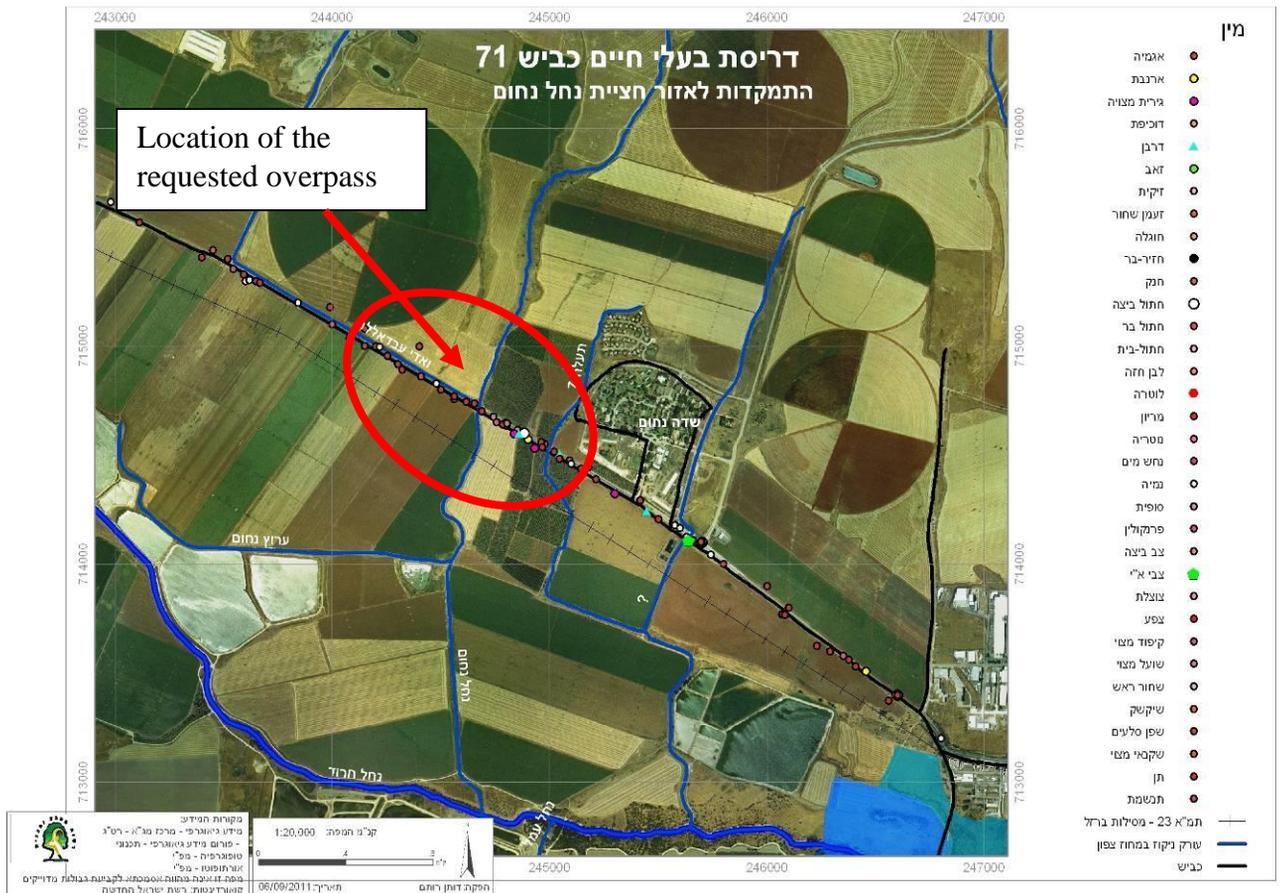
**Figure 1: Distribution of Gazelles in the region of Mt. Gilboa, Harod Valley and Ramat Tzva'im:**

Observations of gazelles in the areas between Mt. Gilboa and Nahal Yissachar. High concentrations of observations can be seen in the uncultivated regions (nature reserves and woodland) as well as individuals approaching Road 71 at the base of Nahal Nahum and the cultivated areas around it. The location of the requested crossing is marked by a red circle. It is important to note that random observations are shown, and it may be assumed that in practice more individuals approach the road and enter the agricultural area where the presence of the observers is limited.



**Illustration 1: Gazelles in cultivated fields in the Ramat Tzva'im region**  
(photo - Alon Levy, Nature and Parks Authority)

Wildlife road fatalities on Road 71, as well as on other roads in the region, were examined thoroughly by the Nature and Parks Authority regional ranger, Roy Ben-Yosef, between 2000 and 2003, and the figures were analyzed to understand the impact of the road on wildlife in the region (Sinai & Ben-Yosef, 2004). Road fatalities were collected similarly until 2008, and they were partially analyzed (Rotem, 2009 A). It was found that along this road, on which there is very heavy traffic, more animals are run over than on all the roads in the region (Sinai and Ben-Yosef, 2004; Rotem, 2009 A). The species that are most vulnerable are the more common ones, such as golden jackals (*Canis aureus*) and common mongooses (*Herpestes ichneumon*), but there were also swamp lynx, which rely on the water sources in the area, as well as otters and gazelles. The last three are defined as threatened species at various levels according to the Israel Vertebrates Red Book (Dolev & Pervolotzky, 2002). That is to say, the road already constitutes a problematic barrier to wildlife today, when it has only two lanes with no median strip along it (Figure 2).

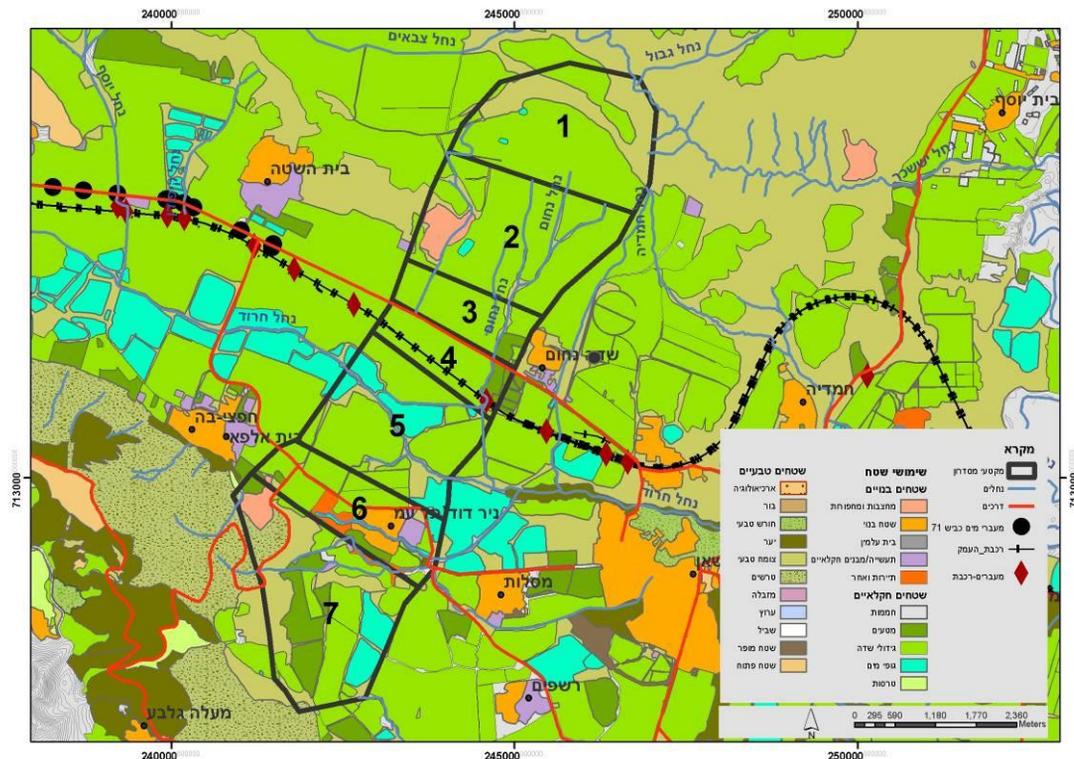


**Figure. 2: Wildlife Fatalities, Road 71 - focusing on the Nahal Nahum crossing region**

Wildlife fatalities on Road 71, from the Nature and Parks Authority data for the years 2000-2011. A large concentration of fatalities can be seen at the Nahal Nahum crossing compared with other parts of the road shown on this map. That is to say, the place already constitutes an important traffic route for various animals in the region between Mt. Gilboa to the south and Ramat Tzeva'im to the north.

The Ecological Corridors document (Shkedi & Sadot, 2000) pointed to the Harod Valley as a central part of the eastern route in the national ecological corridors network. Furthermore, a "bottleneck" was located at the Road 71 crossing, according to the document on wildlife crossings of roads, issued jointly by the PWD and the Nature and Parks Authority (Shkedi & Sadot, 2004). Apart from the national importance of the corridor, the Nature and Parks Authority decided to commence detailed planning of an ecological corridor. The Harod Valley region, where the ecological corridor is based on a broad and complex agricultural interior, was selected for detailed planning. Some of the reasons are those items of linear infrastructure in the form of a railroad (the "Valleys Railroad") and the widening of Road 71, which will constitute a future threat to the ability of wildlife to cross both the cultivated expanse and these linear obstacles. In a detailed analysis, Kaplan & Witman, 2011, focused on the north-south route based on Nahal Nahum (Figure. 3), and set forth the treatment and the measures to be taken in

order to improve the function of this axis as an ecological corridor which, as aforesaid, is based on agricultural fields and the crossing of the railroad and Road 71 bottlenecks.



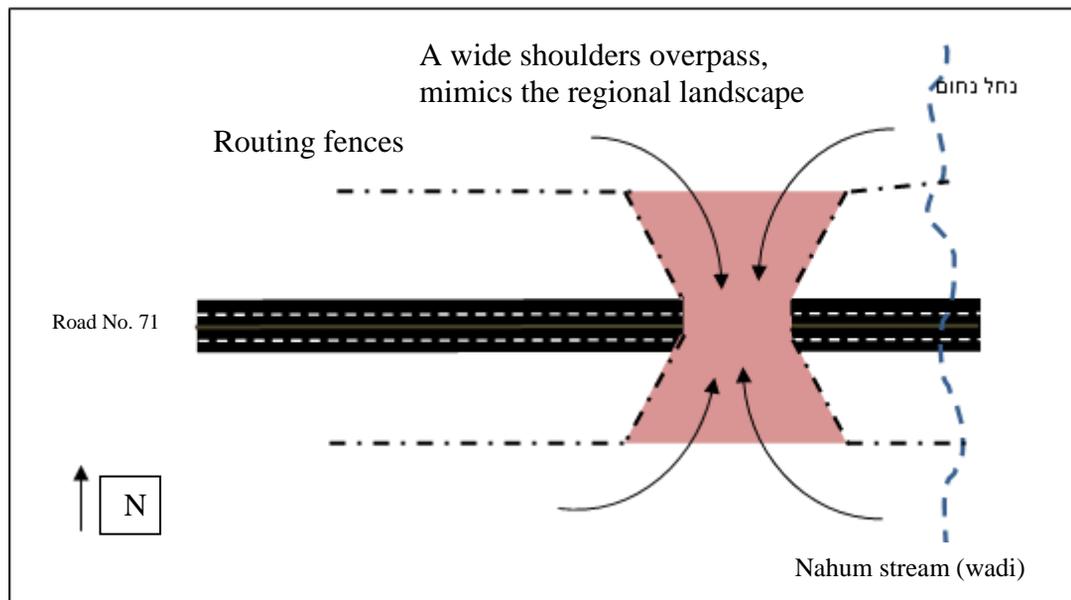
**Figure 3:** The detailed corridor section, from: "The Ramat Tzeva'im - Mt. Gilboa - Harod Valley Ecological Corridor". Sections 3 and 4 analyze the linear infrastructure crossing of Road 71 and the Railroad and recommend an overpass at that point (Kaplan & Witman, 2011).

Wildlife overpasses are of great importance in preserving land connectivity between the two sides of the road which they bridge (Corallti et al., 2009). Observations made up to now (Malihi & Sadot, 2010; Guttman et al., 2005) found that the majority of the large and medium-sized mammals cross via underpasses. But the road constitutes a barrier for other groups of ground-based animals, i.e. they cannot fly over the road, among them reptiles, small mammals and many arthropods, some of them soil-dwellers which almost never rise to the surface, such as the Middle East blind mole-rat (*Spalax ehrenbergi*), various species of shrews (Schrag, 2003), and reptiles, such as the blind thread snakes *Leptotyphlops* sp. and *Typhlops*. For such creatures, conduits made of concrete or materials foreign to their natural environment constitute an impassable barrier. Various worldwide studies have shown a fragmentation trend between populations of arthropods on both sides of roads (e.g.: Keller & Largiadre, 2003).

Studies conducted in Spain and Germany (Mata et al., 2008) have shown that wild boars prefer overpasses to underpasses. In Canada large predators which do not use the underpass, do use the overpass (Schrag, 2003). Deer prefer an overpass 3 to 12 times

more than an underpass. In addition, underpasses have disadvantages such as flooding, blockage with soil and deteriorated function (Oron & Sinai, 2010). It turns out that to date, in the north of Israel, no gazelles have been documented using underpasses under roads. The crossings planned for Road 71 are very low, due to the local topography, and therefore will not be suited for the passage of gazelles. To date, two overpasses have been constructed in Israel for wildlife. One over Highway 6, in the Nahal Dalia region, 150 m. wide, and the other over Road 70, in the Bat Shlomo region, 50 meters wide. Both overpasses are being monitored by cameras and by examination of animal tracks.. The following species have been documented on these overpasses until now: wild boar (*Sus scrofa*), red fox (*Vulpes vulpes*), mountain gazelle (*Gazella Gazella*), common badger (*Meles Meles*), common mongoose (*Herpestes ichneumon*), Middle East blind mole-rat(*Spalax ehrenbergi*) and others (Ben Rosenberg & Ron Frumkin - personal communication). It is important to note that the crossing on Road 70 has been functioning in practice for 8 months, and the traffic documented there is extensive.

**Structure of the crossing:** Israeli gazelles live in a variety of habitats, as well as on rather steep slopes, such as Ramot Naftali. At the same time, the character of the crossing must be adapted to its location. The crossings constructed over Highway 6 and Road 70 rely on raised shoulders on both sides of the road, and in fact complement the hills that were excavated for the passage of the road, and reconstruct to a certain extent the landscape that had been damaged. The Harod Valley, as aforesaid, is flat, and the adjacent Ramat Tzeva'im is a moderately hilly area. In order to reach the crossing, the gazelle has to pass relatively flat, open terrain of agricultural fields and along Nahal Nahum. Therefore, it is necessary to aim at having the slope by which the gazelles reach the crossing being as moderate as possible, creating no sudden steep slope that is not typical of the region and might deter any animal from climbing it. From consultations with Ron Frumkin (an Ecologist advising the road company) it emerged that a slope that is at least 1:6 is reasonable for this area. Furthermore, it is also necessary to draw the animals in the direction of the overpass, including fencing and use of local vegetation to create natural continuity for the range of soil-dwelling creatures at which the crossing is aimed. In order to simulate a hill, a crossing with a broad "waist" should be constructed, converging in the direction of the overpass (Figure. 4).



**Figure 4:** Schematic diagram of the planned overpass above Road 71. A broad waist and moderate slope are required in order to create an artificial hill which can be accessed and climbed as part of the "ordinary" movement in the region.

The construction of the overpass is accompanied by activity to assimilate it into the ecological corridor, as planned by the office of Motti Kaplan (Kaplan & Witman, 2011). The Nature and Parks Authority holds meetings with various stakeholders in the Ministry of Agriculture at national and regional levels, and thereafter with farmers as well as with the Southern Jordan Drainage Authority. These measures are taken in order to ensure that the areas leading up to and from the overpass will remain open, and steps will also be taken to improve the function of the corridor, such as reducing the spraying of pesticides, enlarging the verges of the fields and other actions.

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