REPORT ON A SURVEY OF THE TERRESTRIAL ECOLOGICAL RESOURCES OF THE QAWRA/DWEJRA AREA, WESTERN GOZO, COMMISSIONED BY NATURE TRUST (MALTA)

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1 GENERAL SUMMARY: ECOLOGICAL IMPORTANCE AND CONSERVATION VALUE OF THE AREA OF STUDY

The ecological importance and conservation value of the AoS derives from synergy of a number of factors that are either unique or limited in distribution over the Maltese Islands. Moreover, the area's ecological, palaeontological and geomorphological assets are of exceptional importance on a regional level and on a global scale. As such, conservation and management measures should consider the area in its entirety rather than focus on individual features.

1. Ecological importance in general is based on the superimposition of many of the typical habitat types of the Maltese Islands (karstic terrain with steppe and garrigue, gently sloping rocky coast, vertical cliffs, various types of *widien*) as well as a significant number of unusual ones (freshwater wetland, saline marshland, freshwater pools, shingle beaches). These habitats support a rich biota that includes a significant number of endemic elements as well as others that are rare and/or have a limited distribution in the Maltese Islands and the Mediterranean and are therefore of scientific, biogeographical and cultural interest. A number of species within the Qawra/Dwejra area are threatened on a national scale, and some also on a regional level. The area is also of significance from the point of view of avifauna, providing a suitable habitat for a number of resident and migratory species.

2. From the ecological point of view, the terrestrial part of the coast within the study area is particularly important because it supports habitat types which are rare in the islands. Examples include biotic communities of low-lying rocks, coastal cliffs, shingle beaches, saline marshlands and transitional coastal wetlands. These localities are valuable, firstly as examples of their particular habitat and, secondly, because they support specialised biota which, since its habitat is rare in the islands, is itself rare. Some of this biota is also endemic to the Maltese Islands. Some localities are important primarily because of certain species or groups of species which live in them. Examples include the only known localities of occurrence of certain endemic species, type localities and important bird-nesting sites.

3. The AoS is also of considerable geological and geomorphological interest. It comprises extensive coastal cliffs, several large-scale Miocene solution subsidence structures, phreatic tubes, sea-caves, coastal erosional features, rocky coasts and a large deposit of Quaternary age.

4. The AoS is characterised by significant fossil deposits, both from the Oligo-Miocene marine succession, as well as lacustrine and terrestrial ones from the Quaternary.

5. The Qawra/Dwejra area is relatively remote, by local standards, from the urban centres of Gozo, and even more so from those of Malta, and gives the visitor a sense of open space and 'wilderness'.

6. The educational value of the AoS is considerable. One can learn a great deal about Mediterranean ecology and biogeography from a short visit to the area, and much about the geology, geomorphology, palaeontology, ecology including flora and fauna, evolutionary biology, and history of the Maltese Islands.

7. It is also a relatively pristine site in that human influence, although pervasive as elsewhere in the Maltese Islands, has had limited negative impacts on the area as a whole and although in some cases (e.g. quarrying, building development) quite significant, such impacts are limited to fairly circumscribed areas and therefore potentially manageable.

2 INTRODUCTION

2.1 General

The present survey of the terrestrial ecological resources of the Qawra/Dwejra area, Western Gozo has been commissioned by Nature Trust (Malta). The report describes the late dry-season terrestrial environment within an area that follows the boundaries of the proposed Qawra/Dwejra Heritage Park and evaluates the ecological and conservation significance of the biotic assemblages present within this area.

2.2 Administrative context

The present study is being carried out in the context of the Dwejra LIFE project, awarded to Nature Trust (Malta) under the LIFE-Third Countries component of the European Union's LIFE programme (Commission Reference: LIFE03 TCY/MT/000047). The Project was awarded to Nature Trust (Malta) in 2003 and runs from 1st April 2004 to 31st March 2007. Project partners include the Malta Environment and Planning Authority and Associazione Italiana per il WWF. The general aims of the project are as follows:

- Development of a restoration / conservation and management plan
- Establishment of a framework for environmental management
- Strengthening of current administrative and enforcement capacities
- Implementation of environmental education programmes through the creation of an eco-tourism and environmental education site
- Use of the project as a demonstration for the creation of further coastal nature reserves
- Creation of a Coastal Nature Reserve which conforms with the objectives of the Coastal Zone Management Subject Plan, as well as the Structure Plan for Malta and Gozo.

2.3 Previous work concerning the Dwejra Area

The Dwejra area as a whole, as well as features within its boundaries, have been investigated by various authors.

Studies of the area as whole include Anderson & Schembri (1989), Schembri (1991) and Fava *et al*. (1996). These three reports highlight the scientific and cultural importance of the Qawra/Dwejra area and recommend its preservation both as a protected area under local legislation, as well as a Natural World Heritage Site, an idea first mooted in the 1989 coastal zone survey commissioned as part of the preliminary studies leading to the formulation of the Malta Structure Plan. [see also Anderson, E.W.; Role, A. & Schembri, P.J. (1992)]. A later study by Hathaway (2000) provided an appraisal of the ecological, geological, geomorphological and landscape value of Dwejra and its environs and proposed a management plan for the area. Brief paragraphs outlining the ecological and geological assets at Dwejra and L-Għadira ta' Sarraflu were included in Schembi *et al*. (1987).

The vegetation of the area was surveyed by Vella (1996). This study focused on plant communities from Ta'Slima to the Tal-Port area, with inland penetration approximately in line with the eastern margin of the Qawra solution subsidence structure. The plant communities along the periphery of the present area of study were described by Cassar & Lanfranco (2000) in the context of the ecological studies carried out for the Gozo and Comino Local Plan.

The Pleistocene colluvium within the solution subsidence structure at il-Qawra was surveyed by Pegrum (1974) as part of a study of Quaternary landforms in Gozo.

Additional studies focusing on circumscribed parts of the Area of Study include those of Schembri et al. (1994) and Lanfranco et al. (1996) on the Wied Guno/Wied Pisklu/Wied il-Kbir system Lanfranco (1997) and Lanfranco & Cassar (2001) on Ta'Slima; Cassar & Lanfranco (2004) on Wied Merell and its environs and Cassar, Lanfranco & Schembri (2004) on Tal-Ponta and its environs.

3 METHODS

3.1 General

This study is based on site visits made by the authors during August, September and October 2004 and is supplemented by material from the literature and the consultants' previous experience of the study area. Habitats were characterised based on geomorphological features and plant assemblages as outlined in (Schembri 1991) and modified by Schembri *et al*. (1999). Nomenclature of plant communities follows the Palaearctic Habitat Classification system (Devillers P. & J. Devillers-Terschuren, 1996). Terms such as steppe, garrigue and maquis have been used to indicate grades of ecosystem development rather than specific communities. No attempt was made to provide a complete inventory of the flora and fauna present, as this would have entailed extensive fieldwork during different seasons. However indicator species and species of ecological and/or conservation importance, especially those listed in the Red Data Book for the Maltese Islands (Schembri & Sultana 1989), were actively searched for during the field surveys. The designation RDB refers to the *Red Data Book* status of species recorded.

3.2 Assessment of plant communities

Assessment of the plant communities colonising the area of study was carried out through a straightforward census of species in a vegetative, flowering or fruiting stage. The species inventory comprises remarks on community affiliation and *Red Data Book* status for each species listed. This inventory obviously omitted all species that were not at the vegetative, flowering or fruiting stages of their life cycle. The presence of a number of species that were not vegetative at the time of survey was inferred through observation of fruits and withered aerial parts. Identification of vegetation was carried out in the field by the authors. Voucher specimens of forms that were not identified *in situ* were collected and compared with reference material.

It should be emphasised that the timing of the study was not optimal as it did not coincide with conspicuous life-cycle phases (vegetative, flowering or fruiting) of a significant proportion of plant species known to occur in the area. As such the authors have augmented the data collected during survey with their own recent records from the area.

No specific sampling for fauna was carried out. Reference to species of scientific and cultural interest and those of conservation concerm was based on the literature and on the authors' unpublished records compiled during this and other field surveys in the area.

4 DESCRIPTION OF THE SITE AND ITS ENVIRONMENT

4.1 Location

The area of study (henceforth referred to as the AoS) was defined by Nature Trust in the Terms of Reference followed by the present consultants. The AoS comprises land along the western coast of Gozo following the boundaries of the proposed Qawra/Dwejra Heritage Park as indicated in Gozo and Comino Local Plan Policy GZ-Slwz-1 and marked on GCLP MAP 14.10-E (Figure 3).

4.2 Geomorphological context of the AoS

The dominant geomorphological features in the AoS are a number of solution subsidence structures of Miocene age. Two of these, at il-Qawra and il-Bajja tad-Dwejra/Il-Port are large and well-defined along their circumference. Other subsidence structures along this coast have been subject to significant modification since their formation and are identifiable through observation and inference. Much of the coastline of the AoS is bounded by sheer cliff outcropping on Lower Coralline Limestone. These cliffs have been interpreted as remnants of other solution subsidence structures that have eroded away completely except for their eastern margins. Shorelines that are not characterised by cliff are rocky, and no significant sediment beaches are directly exposed along the coast. A shingle beach within the Qawra subsidence structure ("Inland Sea") is relatively sheltered and not directly exposed to the coast. Wave action is frequently transmitted though the tunnel connecting with the open sea and may, in cases, be magnified by this transmission. The AoS is traversed by a relatively simple network of dry valley systems. Wied Pisklu, Wied il-Kbir, Wied Għorof and Wied Sufar drain into the solution subsidence structure at Il-Qawra whilst Wied ta' Labbatija, Wied ta' Birrix and Wied ta' Kerrex drain into the Tal-Port area. Erosion of the valley systems by fluvial processes has produced a succession of steep sided gorges associated with potholes and smooth sided hollows. Karstification of limestone is evident, and has promoted the formation of kamenitzas and phreatic tubes in various portions of the valley. The AoS is traversed by a number of faults and inferred faults (Oil Exploration Directorate, 1993). The geomorphological features of the area are further treated in Section 6.

Dominant surface outcrops in the AoS are represented by Lower Globigerina Limestone, with Middle and Upper Globigerina Limestone outcropping on the upper banks of the valley systems and on higher ground. Outcrops of Blue Clay are present within the solution subsidence structure at il-Qawra and in the Tal-Port area. Surface outcrops (as opposed to vertical exposures along cliff side) of the Xlendi member of the Lower Coralline Limestone formation are relatively infrequent and mainly restricted to the deepest parts of the beds of Wied il-Kbir, Wied Pisklu, Wied Sufar and Wied Għorof. General's Rock (Il-Ħaġra tal-Ġeneral, Fungus Rock), representing part of the wall of the subsidence structure at il-Bajja tad-Dwejra is entirely composed of Lower Coralline Limestone. A structure of Quaternary age (Pegrum, 1974), composed of colluvial deposits with intervening palaeosoils was present in the north-eastern sector of the subsidence structure at il-Qawra.

4.3 General Description of Land-cover

Much of the AoS, apart from cliff faces, has been subject to significant anthropogenic modification. Nonetheless, traces of the original vegetation communities (defined as the climax vegetation that would be expected to colonise the area under present-day tectonic, geomorphological and climatic conditions) persist in relatively extensive

areas. Large tracts of land have been exploited for agricultural practice with consequent extirpation or depletion of natural populations. Large areas of land have also been utilised for rock quarrying with consequent obliteration of natural communities in the area. Such land uses have promoted the development of structurally-simple, largely herbaceous assemblages dominated by ecological opportunists and that are capable of exploiting transient gaps in habitat-space. The composition of such assemblages is variable across the AoS reflecting the inherent stochasticity of initial colonisation and population maintenance. Relatively recent declines in agricultural activity released relatively stable, undisturbed areas for colonisation and have therefore provided a substrate for secondary ecological succession ("old-field" succession). Various shrub formations in the area may be accreting through such a process. Much of the sides of Wied il-Kbir, Wied Pisklu, Wied Sufar and Wied Għorof were colonised by assemblages consistent with the steppe/garrigue stage of community development. These communities are probably primary as the steeper slopes have never been subject to cultivation. The valley beds comprised a mosaic of assemblages including remnants of watercourse communities, assemblages of disturbed areas and wooded thickets. A number of woodlots, generally comprising *Eucalyptus* sp. or *Acacia* sp. were recorded throughout the area. Anecdotal and observable evidence suggests that these woodlots have been established by bird-shooters with the express intention of attracting avifauna. Steppe habitats dominated by grasses and geophytes were rerecorded from several parts of the AoS and were particularly prominent within the subsidence structure at il-Qawra. The structure of these communities may partially represent an ecological response to grazing pressures. Primary communties were largely represented by extensive and structurally well-developed shrub formations noted from the shallow slopes overlooking the sheer cliffs. High levels of exposure to wind and saline spray would have rendered such areas less profitable for agriculture with consequent proliferation of these natural communities. Wetland habitats were noted in the eastern sector of il-Qawra and at Tal-Port.

5 HABITATS AND BIOTA

Habitats and biotic assemblages noted during the field surveys were mapped on the accompanying survey sheet. It should be remarked that there is no clear-cut delineation between adjacent habitats or assemblages. The habitats map, although accurate, should therefore be treated as indicative of the extent of the units identified. In the present study, the breadth of ecotones should be considered as narrow compared to the extent of the habitat/assemblage. The vegetation communities identified in the study area are described below. The headings describing each assemblage correspond to legend codes in the accompanying vegetation map.

5.1 Sea Cliff with rupestral communities

Legend:
Maltese rdum communities: based upon *Darniella melitensis, Daucus rupestris, Daucus gingidium, Limonium melitensis, Helichrysum melitense, Hyoseris frutescens, Chiliadenus bocconei* and *Cremnophyton lanfrancoi.*
Maltese rdum communities: based upon *Darniella melitensis, Anthemis urvilleana*, *Capparis orientalis* and *Matthiola incana melitensis*.

Much of the western boundary of the AoS and much of the internal circumference of the solution subsidence structure at il-Qawra were characterised by sheer cliffs outcropping on lower coralline limestone (Figure 17). Vertical cliff faces and horizontal or sub-horizontal cliff ledges were colonised by a sparse, low-diversity

rupestral community dominated by perennial shrubs (Figure 9). The principal colonists of the coastal cliffs along the seaward boundary were generally Maltese Salt-Tree *Darniella melitensis* [RDB: Endemic] and Caper *Capparis orientalis*. Other species including Golden Samphire *Inula crithmoides*, Maltese Everlasting *Helichrysum melitense* [RDB: Endemic, RR, Rest (MI)] and Maltese Cliff Orache *Cremnophyton lanfrancoi* [RDB: Endemic, R, Rest (MI)] were also recorded from this habitat, in some cases achieving local dominance. Vertical faces along the internal circumference of the solution subsidence structure at il-Qawra were dominated, in terms of coverage, by Maltese Everlasting and by Tree Spurge *Euphorbia dendroides*. The vegetational community in these habitats may be interpreted as a specific climax since any autogenic development is unlikely. In such a habitat, community structure is largely controlled by restriction of the pool of potential colonists as a consequence of geomorphological constraints.

The main species recorded from rupestral communities are listed in Appendix A.

5.2 Overcliff slopes and plateaux

Legend:
Mosaic of Maltese rdum communities, ermes, aerohaline and Mediterranean
Mediterranean subnitrophilous grass communities dominated by *Stipa capensis*
***Hypericum* phrygana**
Tree spurge formation
Hyblaeo-Maltese sea-cliff communities: based upon *Crithmo-Limonietalia*
Aerohaline assemblages of the cliffs and rocky shores with endemic sea-lavenders.
Ermes based on *Urginea pancration*, *Carlina involucrata*

Sheer cliffs in the AoS were generally overlain by gentle seaward slopes. Slope angle was recorded at various points and varied between approximately 15° and 30° in a seaward direction. The vegetation colonising such slopes was not homogenous and comprised a variable mosaic of species characteristic of rupestral habitats, species of aerohaline communities as well as assemblages consistent with ermes and subnitrophilous grass communities. Areas colonised by such assemblages formed a band running approximately parallel to the coastline and included the upper coastal slopes at It-Turretta, ix-Xurbeb and Ta' Ħarrux in the Southern portion of the AoS and Iċ-Ċnus, Fuq il-Qwara and Ta' Slima in the Northern sector (Figure 11).

The species composition of these assemblages, along with contextual indicators of anthropogenic activity (such as dry stone walls), suggest superimposition of autogenic secondary succession on pre-existing maritime garrigue. The perennial framework of the present aerohaline communities may represent a regenerated climax or a relict climax from pre-disturbance communities. Dominant species over the whole extent of this mosaic assemblage included Golden Samphire *Inula crithmoides* and Maltese Salt-Tree *Darniella melitensis* [RDB: Endemic]. Other species, including Seaside Squill *Urginea pancration* [RDB: Rest (MED)], Cliff Carrot *Daucus rupestris* [RDB: Rest (MED+MI)], Egyptian St John's Wort *Hypericum aegyptiacum* [RDB: Rest (MED)], Bushy Restharrow *Ononis natrix* ssp. *ramosissima*, Mediterranean Thyme *Thymbra capitata*, Tree Spurge *Euphorbia dendroides* and Maltese Everlasting *Helichrysum melitense* [RDB: Endemic, RR, Rest (MI)] achieved local dominance in various parts of this assemblage. *Helichrysum melitense* was particularly abundant at Fuq it-Tieqa and Fuq il-Qawra whilst a relatively extensive patch of *Hypericum aegyptiacum* was recorded from a coast-fringing area close to

Ta'Slima. The largest confluent coverage of *Ononis natrix* ssp. *ramosissima* was recorded in the vicinity of Torri tal-Qawra. Species composition in the region extending from it-Turretta to Ta'Ħarrux was characterized by relatively extensive coverage of herbaceous forms including Common Awn-Grass *Stipa capensis*. White Round-Headed Garlic *Allium arvense* [RR, Rest (MI]) was recoded from the cliff edges at Ta'Ħarrux. An invasive alien species, Hottentot Fig *Carpobrotus edulis*, was noted from the environs of Fuq it-Tieqa.

The main species recorded from each area colonized by such an assemblage are recorded in Appendix B.

5.3 Wied Pisklu / Wied il-Kbir valley system: Valley Sides

Legend:
Tree Spurge formation
Labiate garrigue/Ermes mosaic
***Hypericum* phrygana**
Ermes based on *Urginea pancration*, *Carlina involucrata*

The valley sides along Wied il-Kbir and Wied Pisklu were colonised by a mosaic of assemblages dominated by shrubs interspersed with regenerative successions characterised by grasses. Shrub assemblages were generally noted from areas where topsoil had been largely eroded, exposing karstified bedrock. In such areas, topsoil was restricted to isolated pockets insulated within solution hollows in bedrock (Figure 13). The frequency and abundance of the dominant shrubs varied considerably along the valleys sides with various species achieving local dominance. Tree Spurge Formations comprising relatively large populations of *Euphorbia dendroides* were noted from the northern banks of Wied il-Kbir and Wied Pisklu. Steeper slopes, particularly along the sides of Wied Pisklu, were colonised by shrubs including Rock Crosswort *Crucianella rupestris* [RDB: Rest (MED)] and Egyptian St John's Wort *Hypericum aegyptiacum* [RDB: Rest (MED)], generally considered characteristic of rupestral habitats. A relatively extensive patch dominated by *Hypericum aegyptiacum* was noted from the northern banks of Wied Pisklu, along the Eastern boundary of the AoS. Various tracts along the southern banks of Wied il-Kbir, along the northern banks of Wied Pisklu and along the junction of the two valleys were colonised by assemblages dominated by Lamiaceae including Wild Thyme *Thymbra capitata* and Olive-Leaved Germander *Teucrium fruticans*.

Areas characterised by greater confluence of topsoil and not occupied by shrubs was colonised by herbaceous species consistent with the structural organisation of steppe, including Carline Thistle *Carlina involucrata* [RDB: Rest (MED)], Seaside Squill *Urginea pancration* [RDB: Rest (MED)] and by presumed emigrants from the surrounding agricultural land including Prickly Pear *Opuntia ficus-indica*.

The main species recorded from these assemblages are listed in Appendix C.

Legend:
Mediterranean subnitrophilous grass communities dominated by *Stipa capensis*

The north-eastern banks of Wied il-Kbir in the vicinity of Ta' Għajn Abdul were colonised by assemblages dominated by herbaceous forms, particularly grasses. Such assemblages may represent a regenerative sere, colonising areas that were

presumably exploited for agriculture in the past. The principal colonists of this part of the valley bed included Common Awn-Grass *Stipa capensis* and Seaside Squill *Urginea pancration* [RDB: Rest (MED)]. Parts of the assemblage skirting the valley bed, and therefore presumably subject to occasional inundation during the wet season, comprised species associated with wetland areas including Pennyroyal *Mentha pulegium*. Isolated Bushy Restharrow *Ononis natrix* ssp. *ramosissima* was also recorded from these areas. The main species recorded from this assemblage are listed in Appendix D.

5.4 Wied Pisklu / Wied il-Kbir valley system: Valley Bed

Legend:
***Arundo donax* stands**
Watercourse (valley bed)

The beds of Wied Pisklu and Wied il-Kbir are inundated by seasonal flows of freshwater derived from surface runoff and direct precipitation and are consequently colonised by assemblages that are structurally and functionally typical of aquatic habitats. The form and distribution of vegetation along the valley bed indicates water flow that is both spatially and temporally variable. The presence of thickets of woody species including Olive *Olea europaea* [Rest (MI)?], Carob *Ceratonia siliqua*, Fig *Ficus carica*, Tamarisk *Tamarix Africana* [RDB: R, Rest (MED+MI)], *Eucalyptus* and *Acacia*, all of which are intolerant of prolonged flooding, suggests that water flow immediately following heavy rainfall is likely to be relatively short-lived. The presence of macrophytes, such as Pennyroyal *Mentha pulegium* (Figure 15) and Dock *Rumex* spp. that are generally associated with temporary waters, indicates that longer-term retention of water in the bed occurs in relatively small and isolated depressions rather than over the entire length of the watercourse bed. Much of the bed of Wied Pisklu is colonised by monospecific (and possibly monoclonal) stands of Great Reed *Arundo donax*. The valley bed community in the terminal segment of Wied il-Kbir system was characterised by inclusions from maritime communities *Inula crithmoides*, *Crithmum maritimum*. The appearance of such halophytes in the community is a consequence of the proximity of this part of the valley to the coastal assemblages with which it interfaces.

Parts of the bed of Wied il-Kbir comprised scour marks and kamenitzas in bedrock. These kamenitzas can retain water for relatively long periods during the wet season, forming **temporary freshwater rockpools** in the valley bed. The pools were desiccated at the time of survey. Recent colonists included Narrow-Leaved Aster *Aster squamatus* and Pennyroyal *Mentha pulegium*. Calcified remnants of Stonewort *Chara* sp. were also noted. It should be mentioned that these particular pools are the only known site in the Maltese Islands for the Cladoceran *Moina brachiata* (Lanfranco, 2001). The original watercourse community was severely degraded at the time of survey and much of the bed of both valleys was occupied by species characteristic of disturbed areas and steppe. Such degradation may be due to extensive anthropogenic influence and to gradual change in hydrodynamics, both of which favour invasion by opportunistic species intolerant of prolonged flooding. The main species recorded from the valley beds are listed in Appendix E.

5.5 Gently-sloping rocky shore

Legend:
Hyblaeo-Maltese sea-cliff communities: based upon *Crithmo-Limonietalia* areohaline assemblages of the cliffs and rocky shores with endemic sea-lavenders.
***Arthrocnemum* community.**

Much of the shoreline from iż-Żerqa to the northern periphery of il-Bajja tad-Dwejra was characterised by a relatively smooth and rolling landscape outcropping on Lower Globigerina limestone. Topsoil was largely absent and generally confined to restricted accumulations of sediment in sheltered depressions. The area was colonised by a sparse, low-diversity aerohaline assemblage dominated by halophytic perennials (Figure 16). Dominant species in terms of abundance and coverage included Shrubby Glasswort *Arthrocnemum macrostachyum* and Golden Samphire *Inula crithmoides* with either of the two achieving local dominance in various areas. Parts of the habitat characterised by greater exposure, such as the environs of il-Ħofra tal-Berwin, were very sparsely vegetated, generally by monospecific patches of *A. macrostachyum*. Community composition along the northern periphery of il-Bajja tad-Dwejra was more heterogenous, with significant inclusions of Sea Fennel *Crithmum maritimum* and Caper *Capparis orientalis*. Maltese Everlasting *Helichrysum melitense* [RDB: Endemic, RR, Rest (MI)] was also recorded from this area.

The main species recorded from this community are recorded in Appendix F.

5.6 Subsidence Structure at Il-Qawra

The terrain enclosed by the solution subsidence structure was colonised by several assemblages representing localised ecological responses to abiotic gradients within the area. The combined effects of relative insulation from exposure, maritime influence, anthropogenic disturbance, grazing, a perennial supply of freshwater and heterogeneous topography have promoted the establishment of a fine-grained mosaic community characterised by distinct enclaves.

5.6.1 Steppe community

Legend:
Mosaic of Maltese *rdum* communities, ermes, aerohalines and Mediterranean subnitrophilous grass communities

The most widespread level of community development within the area is represented by steppe colonising the base of the structure. The combined effect of confluent soil coverage and intermittent grazing (small herds of sheep and goats are still grazed with Il-Qawra, particularly in the Il-Qattara area) has selected for an assemblage comprising a significant proportion of herbaceous forms and species resistant or unpalatable to grazers (Figure 26). Species composition is variable and correlated with seasonal change. The most abundant perennial species in terms of coverage was Golden Samphire *Inula crithmoides*, which was recorded over the whole area. Several other species, particularly Wild Artichoke *Cynara cardunculus*, Carline Thistle *Carlina involucrata* [RDB: Rest (MED)] and Wild Carrot *Daucus carota* achieved local dominance. Parts of the habitat in which levels of soil moisture were presumed to be higher than those in the immediate surroundings were characterised by particularly dense cover of *I. crithmoides*. Such areas included the bed of the water channel that connects the freshwater pool at il-Qattara to the Inland Sea and gradual breaks of slope along which surface runoff would be expected to flow. A

number of wild rabbits *Oryctolagus cuniculus* were noted from this part of the habitat. The main species recorded from this part of the habitat are recorded in Appendix G.

5.6.2 Slopes of Pleistocene Colluvium

Legend:
Mediterranean subnitrophilous grass communities dominated by *Stipa capensis*
Mosaic of Maltese *rdum* communities, ermes, aerohalines and Mediterranean subnitrophilous grass communities

The western and southern slopes of the Pleistocene colluvium (Figure 24) in the north-eastern part of the subsidence structure were colonised by an assemblage characterised by considerable overlap in species composition with the surrounding steppe community. The dominant species in terms of abundance were Golden Samphire *Inula crithmodies*, Wild Artichoke *Cynara cardunculus* and Caper *Capparis orientalis*. Species composition on the eastern slopes of the colluvium was markedly different, comprising higher proportions of shrubs including Tree Spurge *Euphorbia dendroides* and Maltese Salt-Tree *Darniella melitensis* [RDB: Endemic]. The difference in species composition along the western and eastern slopes may be accounted for by the proximity of the eastern slopes to the mouth of the Wied Ghorof system, facilitating infiltration of species from the valley community into the subsidence structure. The principal species recorded from this part of the habitat are recorded in Appendix H.

5.6.3 Transitional coastal wetland

Legend:
Southern riparian galleries and thickets (based upon *Vitex agnus-castus* - Chaste-tree thickets)

A wetland assemblage dominated by Chaste Tree *Vitex agnus-castus* [RDB: R, Rest (MI)] was recorded from the south-eastern portion of the subsidence structure (Figure 25). This assemblage comprised a relatively extensive thicket of Chaste Tree (Figure 28) within which Great Reed *Arundo donax* was interspersed. Understorey vegetation included Common Goosegrass *Galium aparine* and Seaside Squill *Urginea pancration* [RDB: Rest (MED)]. The orientation of the thicket suggests exploitation of subsurface water derived from the adjacent freshwater pool at il-Qattara. An enclave with similar species composition was also recorded along the easternmost rim of the subsidence structure. The main species recorded from this part of the habitatare recorded in Appendix I.

5.6.4 Freshwater pool at il-Qattara

Legend:
Standing freshwater body

The south-eastern margin of the subsidence structure comprised a permanent freshwater seep that channelled into a freshwater pool (Figure 29). The physico-chemical properties of the pool water were not investigated. Principal colonists of the freshwater habitat included Horend Pondweed *Zannichellia melitensis*, macroalgae (*Chara globularis*), sedges (*Cyperus longus*, *Scirpoides holoschoenus*) and various grasses. The vertical rock face bordering the pool was colonised by an assemblage comprising Maidenhair Fern *Adiantum capillus-veneris* and Brookweed *Samolus*

valerandi. The banks of the pool were colonised by species characteristic of wetland habitats including Red Dock *Rumex bucephalophorus* and Pennyroyal *Mentha pulegium*. Other species recorded form the vicinity of the banks included Tamarisk *Tamarix Africana* [RDB: R, Rest (MED+MI)] and a single White Willow *Salix alba* which represents a deliberate introduction during the 1990s. Goldfish have frequently been introduced into the pool, the most recent sightings being during spring 2004. The ecological impact of such introductions has not been assessed. The main species recorded from this part of the habitat are recorded in Appendix J.

5.7 Wied Ghorof system

Legend:
Ermes/aerohaline mosaic
***Hypericum* phrygana**
Tree-Spurge formation

The Wied Ghorof system was colonised by a mosaic of assemblages the distribution of which was correlated with soil depth and soil confluence. Portions of the valley bed at the head of the system were characterised by consistent soil cover were colonised by an assemblage comprising species of maritime steppe, ruderal species exploiting gaps in habitat space and species that may represent escapes from agricultural activity. Species colonising this part of the habitat included Crown Daisy *Glebionis coronarium*, Boar Thistle *Galactites tomentosa* and Fennel *Foeniculum vulgare*. Valley sides further downstream were characterised by shallow and discontinuous soil cover with consequent exposure of bedrock. Such areas were colonised by species of rocky steppe and garrigue including Golden Samphire *Inula crithmoides*, Blue Stonecrop *Sedum caeruleum* [RDB: Rest (MED)] and Egyptian St John's Wort *Hypericum aegyptiacum* [RDB: Rest (MED)]. The steeper portions of the valley sides and valley bed comprised localised pockets of soil cover and were generally characterised by the remnants of a watercourse community on which was superimposed a maritime steppe garrigue. Species that may represent remnants of a watercourse community included Divided Sedge *Carex divisa* and Chaste Tree *Vitex agnus-castus* [RDB: R, Rest (MI)]. Dominant species on the valley sides included Tree Spurge *Euphorbia dendroides*. Localised areas within the valley bed were overgrown with species characteristic of the framework of a developing maquis, including Common Smilax *Smilax aspera*, although it should be stressed that the assemblage as a whole did not attain the maquis stage of community development. The main species recorded from this community are recorded in Appendix K.

5.8 Wied Sufar system

Legend:
Ermes based on *Carlina involucrata*, *Urginea pancration*
Watercourse community
Hyblaeo-Maltese cliff communities
Mediterranean subnitrophilous grass communities dominated by *Stipa capensis*
Tree-Spurge formation

Land cover at the head of the Wied Sufar system was mainly agricultural, both active as well as inactive. Derelcit agricultural areas were dominated by Carline Thistle *Carlina involucrata* [Rest (MED)]. Much of the valley bed was colonised by dense stands of Great Reed *Arundo donax* and woodlots comprising *Eucalyptus* sp. An

incipient plantation of *Eucalyptus* sp. was also noted from the southern banks of the valley. Natural assemblages in this sector were generally characterised by sparse coverage comprising Golden Samphire *Inula crithmodies*, Caper *Capparis orientalis* and Wild Carrot *Daucus carota*. The narrower and steeper parts of the valley further downstream were characterised by outcrops of bare rock colonised by shrubs including Tree Spurge *Euphorbia dendroides*, Olive-Leaved Germander *Teucrium fruticans* and geophytes such as Seaside Squill *Urginea pancration* [RDB: Rest (MED)] and Autumn Narcissus *Narcissus serotinus*. Inclusions from neighbouring maritime habitats, including Sea-Fennel *Crithmum maritimum* were also noted. The main species recorded from this community are recorded in Appendix L.

5.9 Permanent Freshwater Pool at Ta'Sarraflu

Legend:
Standing freshwater body

A large body of freshwater (c.2000m^2) which holds water throughout the year (Figure 31). The aquatic flora and fauna of the pool were not investigated. The margin of the pool was dominated by African Tamarisk *Tamarix Africana* [RDB: R, Rest (MED+MI)], including evidence of natural regeneration (Figure 32). Nonetheless, the systematic distribution of the larger plants suggested deliberate introduction. Other species recorded from the banks of the pool included Golden Samphire *Inula crithmoides* and Oleander *Nerium oleander*. Aquatic emergent vegetation included Great Reed *Arundo donax*. The accessibility of this habitat and the generally permanent presence of a freshwater body tend to encourage introduction of exotic species, ostensibly for embellishment or recreation. Recent introductions include exotic fish (*Gambusia* sp.) and frogs (*Rana* sp.), although the latter may have been present for a much longer period without discovery. Exotic fish are depleting invertebrate populations in the pools whilst *Rana* sp. is in direct competition with the local Painted Frog *Discoglossus pictus pictus* [RDB: V, Rest (MED+MI)] as it is known to prey on its juveniles and tadpoles. The main species recorded from this community are recorded in Appendix M.

5.10 Mounds of construction debris

Legend:
Quarry precincts
Rubble mound

The margins of quarried areas were generally fringed by unconsolidated mounds of construction debris. Area in which debris mounds were noted included Ta'Ghansar, Ta'Slima, Tal-Ponta, Tal-Qattara, Ħabel Lazz and Fuq tal-Bniet. The sizes, ages and stability of such mounds varied considerably across the AoS. All mounds were colonised by macrophytic assemblages the composition of which was dependent on the pool of proximal colonisers and on the age and stability of the mound. Longitudinal observation of mounds in the area suggests that a process of succession is operative, where young mounds are colonised by a flora that is largely herbaceous whilst longer-lived mounds would be colonised by an assemblage of shrubs.

Mounds at Ta'Slima (Figure 30) along the northern fringe of the subsidence structure were colonised by extensive populations of Maltese Salt-Tree *Darniella melitensis* [RDB: Endemic] and Maltese Stocks *Matthiola incana* ssp. *melitensis* [RDB: R, Endemic]. Contextual evidence suggested that *D. melitensis* colonised older mounds

while *M. incana melitensis* colonised more recent ones. This observation was not tested and may merely reflect stochasticity of colonisation rather than succesional change.

Mounds fringing quarried areas at Fuq tal-Bniet were dominated by Shrubby Orache *Atriplex halimus*, although in this case this shrub represents a deliberate introduction. Large mounds at Tal-Qattara comprised Great Reed *Arundo donax* and Shrub Tobacco *Nicotiana glauca*. Mounds that have been recently established, such as those at Tal-Ponta, were generally colonised by a herbaceous assemblage dominated by Crown Daisy *Glebionis coronarium*.

The main species recorded from these assemblages are recorded in Appendix N.

5.11 Derelict agricultural areas

Legend:
Abandoned agricultural land
Long abandoned fields/terraces or degraded parcels of land with secondary succession

Agricultural areas that were no longer under active cultivation were noted throughout the AoS. Relatively extensive tracts were noted from the areas south of Bajja tad-Dwejra and along part of the banks of Wied il-Kbir. In several cases such derelict agricultural land was colonised by an assemblage consistent with the early-pioneer stages of a secondary succession and dominated by species characterised as ecological opportunists. Areas that had been derelict (and relatively undisturbed) for longer periods comprised inclusions from the surrounding maritime communities, including Golden Samphire *Inula crithmoides*. Colonisation by such forms may have been relatively rapid as dry stone walls in the AoS were generally exploited by halophytic shrubs, providing a proximal source of dispersal. Parcels of land characterised by lower frequencies of disturbance were colonised by species generally associated with late-pioneer communities including Seaside Squill *Urginea pancration* [RDB: Rest (MED)]. Agricultural land that had not been under cultivation for several decades was colonised by *K*-strategists, including Olive-leaved Germander *Teucrium fruticans*, Mediterranean Thyme *Thymbra capitata* and Tree Spurge *Euphorbia dendroides* and was indistinguishable from the Labiate Garrigue/Ermes Mosaic and Tree Spurge formations described in previous sections of this report (Figure 20, Figure 21, Figure 23). The main species recorded from these assemblages are recorded in Appendix O.

5.12 Verges and low vertical faces around agricultural areas

Agricultural land, both active as well as derelict, was recorded throughout the AoS. Boundaries of such areas were generally delineated by dry stone walls (rubble walls) colonised by a suite of species including Golden Samphire *Inula crithmoides* and Maltese Salt-Tree *Darniella melitensis* [RDB: Endemic] (Figure 34). A number of verges were also colonised by Smooth-leaved Saltwort *Salsola soda*. Such verges and walls may function as biodiversity corridors and as reservoirs of colonisers. Principal species recorded from verges and dry stone walls are recorded in Appendix P.

5.13 Minor tributaries

Legend: ***Arundo donax* stands**

The southern sector of the AoS was traversed by a number of minor valleys representing tributaries to the Tal-Port area. These valleys (Wied Ta'Kerrex, Wied ta' Birrix and Wied ta' Labbatija) were generally confined by fringing agricultural areas restricting water flows to a narrow channel. Such channels were generally colonised by dense, monospecific (and possibly monoclonal) populations of Great Reed *Arundo donax* (Figure 33).

5.14 Wetland area at Tal-Port

Legend:
Ermes based on *Carlina involucrata*, *Urginea pancration*
Watercourse community
Long abandoned fields/terraces or abandones parcels of land with secondary succesion

The area at Tal-Port was characterised by an ephemeral lotic freshwater habitat comprising a narrow watercourse and a resultant waterfall (Figure 19). The environs of the watercourse were mainly colonised by Golden Samphire *Inula crithmoides* and Fennel *Ferula communis* as well as a variable suite of herbaceous species. The main species recorded from this area are recorded in Appendix .

5.15 General's Rock

Legend:
Stack
General's Rock mosaic of aerohaline elements and rdum communities

This habitat (Figure 18) was not surveyed directly. A description of the ecological assets on General's Rock is given in Section 6.2.3.

5.16 Woodlots

Legend:
Eucalyptus

A number of sites within the AoS were characterised by woodlots of exotic species, mainly Eucalypts, planted in systematic array and usually accompanied by elevated shooting hides (Figure 14). These woodlots have been primarily established in order to attract avifauna for bird-shooting purposes. Such woodlots were generally established on areas that would have previously been under active cultivation.

6 GENERAL ECOLOGICAL EVALUATION AND POLICY CONTEXT

6.1 Introduction

The Qawra/Dwejra area on the western coast of Gozo combines an interesting terrestrial and marine geology and geomorphology that serve as a backdrop for a diverse suite of habitats, some of them of very limited distribution in the Maltese Islands. Within a small area one can observe many of the typical habitat types of the Maltese Islands (steppe, garrigue, gently sloping rocky coast, vertical cliffs, *widien*) as well as a significant number of unusual ones (freshwater wetland, saline

marshland, freshwater pools, shingle beaches). In turn, these habitats support a rich biota that includes a significant number of endemic elements as well as others that are rare and/or have a limited distribution in the Maltese Islands and the Mediterranean and are therefore of biogeographical interest. A number of species within the Qawra/Dwejra area are threatened on a national scale, and some also on a regional level. The area is also a significant ornithological site, providing an adequate habitat for a number of resident and visiting species. The area has significant fossil deposits, both from the Oligo-Miocene marine succession, as well as lacustrine and terrestrial ones from the Quaternary. Cultural elements spanning from the cart-ruts of unknown age (prehistoric?) to the 19th Century add to the interest of the area; in this context, the islet know as Fungus or General's Rock is particularly interesting as the history of the discovery, 'conservation' and exploitation of the so called 'Malta Fungus', which is abundant there, shows the integration of nature and human culture in a way which in a sense is typical of how these two elements have been integrated in the Maltese Islands in general, and indeed, in the whole Mediterranean littoral. Apart from all this, the Qawra/Dwejra area is relatively remote, by local standards, from the urban centres of Gozo, and even more so from those of Malta, and gives the visitor a sense of open space and 'wilderness'.

The area receives many visitors, both locals and tourists, and is an important recreational site. In spite of the large number of people who visit, there is remarkably little impact and the site still retains its wilderness feel. There can be several hundred people in the car-park and Inland Sea areas, but if one walks just a few hundred metres away along the edge of the cliffs, one will be practically alone and surrounded by nature. The area also has great educational value. One can learn a great deal about Mediterranean ecology and biogeography from a short visit to the area, and much about the geology, geomorphology, palaeontology, ecology, flora, fauna, evolutionary biology, and history of the Maltese Islands.

It is for these reasons that the Qawra/Dwejra area has been identified as a site of national and international importance.

6.2 Evaluation of the ecological resource

From the ecological point of view, the terrestrial part of the coast within the study area is particularly important because (a) It supports habitat types which are rare in the islands. Examples include communities of low-lying rocks, coastal cliffs, shingle beaches, saline marshlands and transitional coastal wetlands. These localities are valuable, firstly as examples of their particular habitat and, secondly, because they support specialised biota which, since its habitat is rare in the islands, is itself rare. Some of this biota is also endemic to the Maltese Islands; (b) Some localities are important primarily because of certain species or groups of species which live in them. Examples include the only known localities of occurrence of certain endemic species, type localities and important bird nesting sites.

6.2.1 Coastal cliffs from Il-Ponta tal-Wardija to Ta' Slima

This almost continuous stretch of coastal cliffs from Ras il-Wardija to Ta' Slima, interrupted only by the lowland shore at Id-Dwejra, supports typical cliff-face (rupestral) communities, which differ from those in Malta, both in species richness and in relative abundance. These cliffs are also important habitats for birds and support colonies of Cory's Shearwater *Calonactris diomedea* [RDB: V, Rest (Med)] and the Levantine Shearwater *Puffinus yelkouan* [RDB: V, Rest (Med)]. The rare Peregrine *Falco peregrinus* [RDB: E, Rest (Med)] is also occasionally recorded here. The area above the cliffs is a stronghold of the Short-toed lark *Calandrella*

brachydactyla [RDB: V] and of the declining Spectacled Warbler *Sylvia conspicillata* [RDB: E].

These cliffs are also of major geomorphological interest in view of their imposing dimensions as well as to the morphological processes that they illustrate. Some of the best examples of normal faulting, karstification and solution subsidence, cliff recession, cave formation as a result of marine erosion, and incision of steep-sided valleys to be found in the Maltese Islands occur here. The headland of Ras il-Wardija constitutes the highest vertical cliff face (ca. 150m) in the Maltese Islands and a small Miocene solution subsidence structure is present within the hillock which tops the cliff at Ras il-Wardija.

The high cliffs at Ta' Slima surround a large, sheer-sided, open-mouthed 'gulf' (between It-Tieqa and Kap San Dimitri) which does not follow any known major faults and is most probably the last remaining trace (i.e. the rim) of two huge coalescing Miocene solution subsidence structures. Fissures and joints within the same cliffs have since been enlarged by erosion to form very deep sea caves, including L-Ghar tad-Dwejra, L-Ghar in-Niexef and L-Ghanvolu-Barba (near Il-Qawra).

6.2.2 Il-Port and surroundings

The Il-Port depression (Dwejra Bay) is one of the largest of the known Miocene collapse/subsidence structures[1] and measure some 480m x 365m in extent. After its formation, the western wall of this structure was subsequently penetrated by wave action to form a large rounded inlet and the massive stack known as Il-Gebla tal-General (Fungus Rock), which was itself partly pierced to form a natural arch. A wave-cut platform (known as Il-Mejda ta' Harrux) is present at Il-Ponta ta' Harrux on the southwestern extremity of the inlet. Two large sea-caves, cross-linked to form an H-shaped complex and known as Ghar il-Bumarini, are located in the innermost part of the inlet. The roof of the cross-linking tunnel also supports a small drip-spring *qattara*) with which are associated interesting, albeit restricted, flowstone deposits; the whole complex may have originally started off as a karstic cavern which was later partly submerged and enlarged by marine erosion. The roof of Ghar il-Bumarini is itself overlain by yet another, even larger (800m x 425m), Miocene subsidence structure that forms the basin of the valley known as Il-Wied tal-Port; the tributaries of this valley (notably Il-Wied ta' Birrix, Il-Wied ta' Kerrex and Il-Wied ta' l-Abbatija) are also indirectly controlled by this structure. The neat, near-vertical channel eroded midway between the two mouths of Ghar il-Bumarini by the waterfall at the mouth of Il-Wied tal-Port (a hanging valley) is an interesting superimposition of terrestrial and marine erosion features, uniquely located at the interface between two huge Miocene subsidence structures and produced by their difference in level. A more or less permanent freshwater pool is present within the cliff at the mouth of Il-Wied tal-Port.

6.2.3 Il-Ġebla tal-Ġeneral

The mode of formation and geomorphological significance of this islet have been described above. This islet is especially important for its lizard and for the so called Malta Fungus. The General's Rock Lizard, *Podarcis filfolensis generalensis* [RDB: endemic (Gozo), V, Rest (MI)] an endemic race, formally named as a subspecies of

[1] A solution subsidence structure results when the surface collapses into a circular crater-like hollow due to removal by solution of the underlying limestone. There are two families of such structures in the Maltese Islands: those formed underwater due to seafloor collapse during the Miocene, and those formed on land during the Quaternary. The former are only found in Gozo, and the best examples are Il-Port ('Dwejra Bay') and Il-Qawra. The terrestrial structures are termed dolines and result from cavern roof collapse following enlargement of an underground cavern by groundwater. The best known example of this type of structure is Il-Maqluba on the outskirts of Qrendi on mainland Malta.

the Maltese Wall Lizard, found only on this islet. The famed Malta Fungus *Cynomorium coccineum* [RDB: E, Rest (Med + MI)] is historically and folkloristically associated with Il-Gebla tal-General, which has a large population; this species also occurs at Dingli cliffs, which is thus its only other known locality in the Maltese Islands.

Other flora with a restricted distribution in the Maltese Islands found on the islet, include the endemics: Maltese Cliff-Orache *Cremnophyton lanfrancoi* [RDB: endemic, R, Rest (MI)], Maltese Everlasting *Helichrysum melitense* [RDB: endemic, RR, Rest (MI)], and the Maltese Stock *Matthiola incana* ssp. m*elitensis* [RDB: endemic, R]. Less restricted endemics encountered on the islet are *Limonium melitensis* [RDB: endemic] and *Anthemis urvilleana* [RDB: endemic]. This is also one of the three locations for the Maltese Giant Leek *Allium* sp.nov*.* recorded in the RDB as *Allium melitense* [RDB: endemic (?)].

6.2.4 Id-Dwejra area

A number of important plant species occur in the general area surrounding the Dwejra subsidence structure. The Cat's Foot grass *Aeloropus lagopoides* [RDB: X (?), Rest (Med)], which may now be extinct from the Maltese Islands, was recorded from this area. The endangered Maltese Toadflax *Linaria pseudolaxiflora* [RDB: R, Rest (Med + MI)], and the endemic Maltese Everlasting *Helichrysum melitense* [RDB: endemic, RR, Rest (MI)] grow in this area, although the former seems to have disappeared. This is also a site for the Maltese Giant Leek *Allium* sp.nov*.* recorded in the RDB as *Allium melitense* [RDB: endemic (?)], as well as the White Round-headed Garlic *Allium arvense* [RDB: RR, Rest (MI)], which, in the Maltese Islands is confined to the Island of Gozo.

'Dwejra' is the type locality for three different endemic species: the Maltese Hyoseris *Hyoseris frutescens* [RDB: endemic], the Maltese Stock *Matthiola incana* ssp. *melitensis* [RDB: endemic, R] and the coastal woodlouse *Spelaeoniscus vallettai* [RDB: endemic, RR, Rest (MI)].

Short-toed Lark *Calandrella brachydactyla* [RDB: V], the Blue Rock Trush *Monticola solitarius* [RDB: V], the Spectacled Warbler *Sylvia conspicillata* [RDB: E] and the Corn Bunting *Miliaria calandra* [RDB: V], all breed in the Dwejra area.

Finally, Quaternary deposits rich in fossils of non-marine molluscs, including species of biogeographical importance, occur in the area.

6.2.5 Lowland coast from Ir-Ras to It-Tieqa

This stretch of coast supports biotic communities typical of low-lying maritime rock.

The endemic Maltese False-scorpion *Chthonius (Ephippiochthonius) maltensis* [RDB: endemic, R (?), Rest (MI ?)] occurs in the area.

Extremely well developed *Scutella* beds, marking the upper limit of the Lower Coralline Limestone, characterise this area.

Another large circular Miocene subsidence structure measuring some 340m X 370m in extent and now completely submerged except for its eastern rim, is enclosed between L-Iskoll il-Kbir and the semi-circular stretch of coast between Il-Mellie`a and Ir-Ras. Il-Ħofra tal-Bidwin is a deep seawater pool, apparently a submerged blowhole, which is "separated" from the open sea beneath It-Tieqa by a narrow land bridge (Ix-Xriek) overlying a submerged natural arch. It-Tieqa itself is a huge natural arch formed by wave erosion, one of the best examples of such features present in the Maltese Islands.

6.2.6 Il-Qawra

The depression at Il-Qawra, including the "inland sea", represents a vast circular solution subsidence structure measuring about 400m x 335m in extent and with a vertical subsidence of over 100m. It apparently formed subaerially during an early episode of emergence of the sea-bed during the Miocene, submerged again, and collapsed engulfing the sea-floor and its sediments; this was followed by further collapse after the islands emerged at the end of the Miocene. L-Ghar tad-Dwejra, which according to some authors may actually be a karstic conduit enlarged by marine action, penetrated the roughly 75-metre-thick wall which isolated Il-Qawra from the open sea, thereby enabling partial flooding of the floor of the depression to form the so-called 'Inland Sea'. Superimposed onto this structure is the incision of the valleys known as Wied il-Kbir, Wied Sufar and Wied Ghorof / Wied Merill which open into the depression; the formation of these valleys is itself controlled by the Qawra structure and to some extent (e.g. at Wied Sufar) by pre-existing faults.

Important Quaternary deposits consisting primarily of valley fill deposits make up a low, steep-sided ridge which lies at the mouth of Wied Ghorof and are also present throughout the remainder of the depression, particularly near Il-Qattara.

The quasi-circular shingle beach at Il-Qawra, consisting of fine pebbles in the wet and medium pebbles in the dry zone, although subject to considerable alterations due to human intervention, is one of the best examples of this type of beach in the Maltese Islands. The beach does not support any vegetation, although to the north there is a fairly rich community of halophytes such as *Inula crithmoides*, *Crithmum maritimum, Daucus gingidium* as well as caper and further inland, Chaste Tree (*Vitex agnus-castus* [RDB: R, Rest (MI)]. The pseudoscorpion *Chthonius halberti* was only found on this beach[2].

The Il-Qawra depression supports a community dominated by halophilic plants. Especially conspicuous is a fine stand of Chaste-tree *Vitex agnus-castus* [RDB: R, Rest (MI)] close to Il-Qattara. This is the only known locality in the Maltese Islands for *Crypsis schoenoides*.

6.2.7 Il-Qattara

Il-Qattara is a freshwater pool inside the Il-Qawra depression which is fed by a perennial trickling spring and supports many species requiring a year-round supply of freshwater for their survival. Trickling water extends along the entire escarpment and is not restricted to the pool. A large population of the Maidenhair Fern *Adiantum capillus-veneris*, together with the Wild Celery *Apium graveolens*, mark the moist rockface. Occasionally, the watercourse connecting Il-Qattara to the so called 'Inland sea' at the western end of Il-Qawra floods, and the water becomes brackish.

This is an important breeding site for the Spectacled Warbler *Sylvia conspicillata* [RDB: E]. Corn buntings *Miliaria calandra* [RDB: V] congregate in large groups around the pool during the summer months. A number of interesting freshwater snails occur in the spring feeding the Qattara pool. These include the Freshwater Spire-snail *Mercuria similis* [RDB: E, Rest (MI)] and the Dwarf Pond-snail *Lymnaea truncatula* [RDB: V (?), Rest (MI)].

6.2.8 Ghajn Ghabdul/Il-Mixta

A permanent spring (Ghajn Ghabdul), formed by 'leakage' from the perched aquifer within the overlying small Upper Coralline Limestone cap, exists in the area. The

[2] Gauci, M.J.; Deidun, A. & Schembri, P.J. (in preparation) Faunistic diversity of Maltese pocket sandy and shingle beaches: are these of conservation value?

western face of the plateau is indented with about twelve relatively wide-mouthed caves, collectively known as Il-Mixta, which provide a good illustration of predominantly aeolian erosion. Both the caves and the permanent spring are imminently threatened by hardstone quarrying which has already destroyed much of the plateau.

6.2.9 Wied systems

Four *widien* systems are found in the Qawra/Dwejra area, three of which discharge in the Qawra depression and the other in the Dwejra depression (see diagram). Of the *widien* that converge on Qawra, the largest is the Wied il-Kbir system. This system runs for some 2.4km from Santa Lucia to Il-Qawra. Different sections of this system have different names: the upstream section is Wied Il-Mans, the middle section is Wied Ilma and the downstream part is Wied Il-Kbir; Wied Gullu is a minor tributary, while the Wied Pisklu/Wied Guno/Wied tal-Marga system is a major tributary.

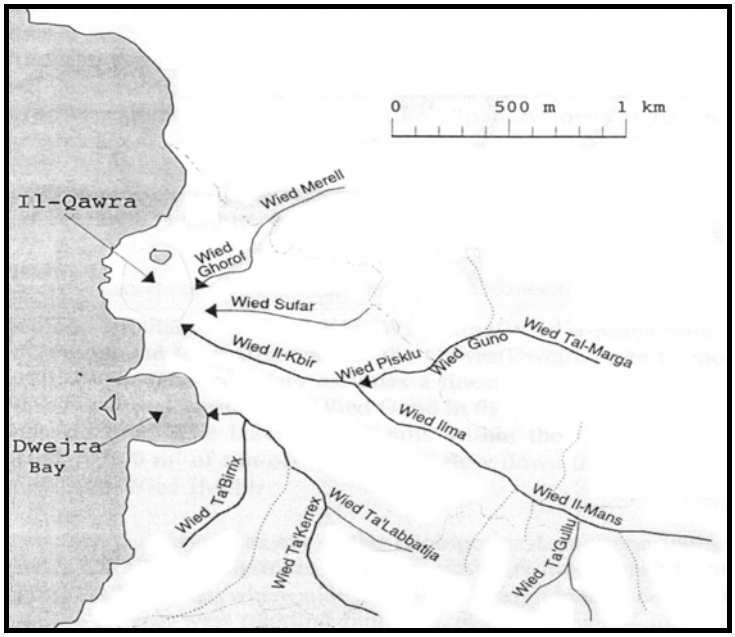

Figure 1: From: Malta University Services Ltd (1996) *Qawra/Dwejra area Gozo: geology, geomorphology and hydrology*. Unpublished report. Msida, Malta: Malta University Services Ltd.

The most ecologically important components are the lower parts of Wied il-Kbir characterised by chasm incised deeply in the Lower Coralline Limestone. The steep vertical rock faces shelter the valley bed and support a rupestral garrigue dominated by Tree Spurge (*Euphorbia dendroides*). The passage of freshwater has moulded the Lower Coralline Limestone bedrock along the valley bed into a variety of erosional features produced by water flow, including smooth, circular depressions scoured by the movement of debris under the action of eddy currents and undercutting of the rocky valley sides.

6.2.10 L-Għadira ta` Sarraflu

This large freshwater pool which is present all year round provides an adequate habitat for a variety of plants and animals requiring a constant supply of freshwater. The pool is located within a steep-sided depression of geomorphological interest, apparently produced by subsidence of the surface Upper Globigerina Limestone crust and subsequent accelerated erosion of the underlying softer Middle Globigerina

Limestone thus exposed. The pierced Upper Globigerina Limestone stratum still displays a markedly concave overhang, partly occluded by old rubble walls. Quaternary (Holocene) deposits rich in fossils of non-marine molluscs, including species of biogeographical importance, are found in the area.

6.3 The Qawra/Dwejra area as a natural heritage site of international importance

On 16th November 1972, the General Conference of the United Nations Educational, Scientific and Cultural Organization (UNESCO) held in Paris, adopted a '*Convention For The Protection Of The World Cultural And Natural Heritage*' that has become popularly known as the Paris Convention or the World Heritage Convention. As the name implies, the aim of this Convention is to protect and preserve for the whole of humankind that natural and cultural heritage that is considered priceless and irreplaceable and of value not only to the country in which it occurs, but to all peoples in the world. The Convention establishes a World Heritage List and a World Heritage Committee; amongst other functions the World Heritage Committee receives from States party to the Convention nominations for cultural and natural properties considered by the national Government to be of outstanding universal value, for inclusion on the WORLD HERITAGE LIST. Malta ratified this Convention on the 14 November 1978 and has to date nominated, and had accepted, a number of cultural properties, including the city of Valletta, the Hypogeum, Ggantija Temples and other prehistoric temples. To date, Malta has not nominated any 'Natural Properties'.

The Paris Convention defines a 'Natural Property' as "*natural features consisting of physical and biological formations, which are of outstanding universal value from the aesthetic or scientific point of view; geological or physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science and conservation; natural sites are precisely delineated areas of outstanding universal value from the point of view of science, conservation or natural beauty*" [Article 2].

A coastal zone survey of the Maltese Islands (Anderson & Schembri, 1989), undertaken in 1989 as part of the preliminary studies carried out in connection with the preparation of the Malta Structure Plan, identified the Qawra/Dwejra area in Gozo as a site of both national and international importance and recommended its conservation and preservation through the enactment of legislation. This recommendation was taken up in the final Malta Structure Plan, which recognises this area as being a site of "*potential international scientific importance because of the complex of features of geological, historical and aesthetic interest*".

The coastal cliffs of the Maltese Islands and the Qawra-Dwejra area were included in Malta's tentative list of sites for the World Heritage List. This implies that Malta has identified these as potential World Heritage Sites, and will in due course submit a formal application to UNESCO for their inscription in the list.

6.4 Policy context

6.4.1 Policies concerning sites and habitats

The island of Fungus Rock in Dwejra Bay, Gozo was established as a Nature Reserve by Legal Notice Nº22 of 1992.

Part of the Qawra/Dwejra area including Il-Gebla tal-General (Fungus Rock), the coastline extending from Il-Ponta tad-Dwejra to the mouth of the wied at Tal-Port in Il-Bajja tad-Dwejra and the 'Inland Sea', were originally declared a 'Nature Reserve' by virtue of Legal Notice 144 of 1993 issued in terms of the Environment Protection Act N$^{o.}$ V of 1991[3]; this designation was later changed to 'Bird Sanctuary' by the Protection of Birds and Wild Rabbit (Amendment) Regulations, 2003 (Legal Notice 41 of 2003; Schedule V).

Malta Structure Plan (MSP) policy RCO14 promotes the designation of National Parks that conform to IUCN designation. Also identifies Ta' Cenc and Id-Dwejra (including Il-Qawra) in Gozo as areas to be designated.

MSP policies RCO35, RCO36, RCO37 and RCO38 apply to the general area of Qawra/Dwejra. Policy RCO35 states that this area shall be declared a National Park as defined by the World Conservation Union (IUCN)[4]. Policy RCO36 envisages that the area be declared a Natural World Heritage Site in terms of the Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris Convention of 1972). Policy RCO37 calls for the establishment of a management authority to co-ordinate and regulate activities within the Qawra/Dwejra National Park in view of the region's scientific and cultural assets. Policy RCO38 states that priority will be given to the creation of Conservation Areas (including the marine habitat) within the same area.

MSP policy RCO 34 identify minor islands in general (together with their ecosystems) as highly vulnerable sites of scientific importance, and establish a blanket prohibition on new physical development on minor islands. This includes General's Rock.

Dwejra is designated a candidate Marine Conservation Area in MSP Policy MCO1(1).

The freshwater wetlands known as Il-Qattara, within the Qawra depression and as l-Ghdiar ta' Sarraflu at Ta' Sarraflu were designated as Level 1 Areas of Ecological Importance and Sites of Scientific Importance (AEIs/SSIs) by Government Notice 288 of 1995 issued under the Development Planning Act of 1992,

An area of ca 1,200m^2 adjacent to Il-Qattara, supporting the largest stand of Chaste Tree (*Vitex agnus-castus*) in the Maltese Islands was designated as a Tree reserve in terms of the Trees and Woodland Protection Regulations (Legal Notice 12 of 2001; Schedule IV).).

The rubble walls and rural structures present within the area of influence are subject to the Rubble Walls and Rural Structures (Conservation and Maintenance) Regulations 1997[5].

The Flora, Fauna and Natural Habitats Protection Regulations, 2003 (LN 257 of 2003) designate 38 sites as Candidate Special Areas of Conservation. These sites

[3] The original Environment Protection Act 1991 [Act V of 1991] was repealed and replaced by the Environment Protection Act 2001 [Act XX of 2001].

[4] This definition of 'National Park' employed by the MSP is essentially that of the World Conservation Union (IUCN) prior to its major revision of the various protected areas management categories in 1994. During the 19th Session of the IUCN General Assembly, held in Buenos Aires, Argentina in January 1994, the IUCN defined six management categories for protected areas (Resolution 19.4). According to this new scheme, a 'National Park' is a "*protected area managed mainly for ecosystem protection and recreation*". As far as the Qawra/Dwejra area is concerned, this definition is not materially different from the previous one, and there is no doubt that the study area satisfies the criteria for a National Park, considering its size, ecology, scientific importance, scenic beauty, recreation value, and the low-intensity human impact (excepting quarrying) relative to the size of the islands, the very high human population, and the very long time the islands have been occupied by humans.

[5] Legal Notice 160 of 1997.

include the Qawra/Dwejra area with Fungus Rock, as a Candidate Special Area of Conservation of International Importance.

The Flora, Fauna and Natural Habitats Protection Regulations, 2003 transpose the requirements of the European Union's Habitats Directive[6] to local legislation. Part II of the Regulations require the setting up of a network of Special Areas of Conservation (SACs) called the National Ecological Network. Part III of the Regulations contemplate two types of SACs: those of national importance and those of international importance. At present, the area listed as "*INT 025. Dwejra-Qawra Area, inkluz Hagret il-General*" is designated as a "*Special Areas of Conservation – Candidate Site of International Importance*" by Government Notice 877 of 2003 issued in terms of the Flora, Fauna and Natural Habitats Protection Regulations, 2003. The boundaries of this site are shown in Map INT05 also published in this Government Notice.

The area shown in INT-025 is wholly within the present study area; the rest of the study area is not legally protected by any local legislation. However, the Flora, Fauna and Natural Habitats Protection Regulations, 2003 provide for the declaration of a 'buffer zone' or 'management area' around SACs in order that the SAC is screened from the impact of detrimental activities occurring in nearby non-protected areas. At present no buffer zone has been declared round INT-025, but given that the INT-025 SAC is greatly influenced by activities and processes with the study area (and beyond), it is almost certain that the whole of the study area will be included within any buffer zone that is eventually designated.

The wied systems in the study area, particularly the Wied Pisklu/Wied il-Kbir system, are of considerable ecological and scientific importance and deserve scheduling as AEIs and/or SSIs. Features which render these widien of conservation importance are the Tree Spurge (*Euphorbia dendroides*) garrigues (for example, along part of the sides of Wied Pisklu), the mixed Tree Spurge (*Euphorbia dendroides*)/Wild Thyme (*Thymbra capitata*)/Olive-Leaved Germander (*Teucrium fruticans*) garrigues (for example, along the sides of Wied il-Kbir), the rupestral assemblages with Egyptian St John's Wort (*Hypericum aegyptiacum*) and Rock Crosswort (*Crucianella rupestris*) (for example, on the steeper sides of Wied il-Kbir) and the kamenitzas on the valley sides and along the valley beds, particularly at Wied il-Kbir.

It is to be noted that kamenitzas are equivalent to the 'Mediterranean temporary ponds' which are listed in Annex I of the Habitats Directive as natural habitats whose conservation requires the designation of Special Areas of Conservation and moreover as 'priority habitats'. Correspondingly, this habitat is also listed in Schedule I (Natural habitat types whose conservation requires the designation of special areas

[6] The European Union's Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora is known as the 'Habitats Directive'. Annexes I and II of this Directive have been amended by Council Directive 97/62/EC of 27 October 1997. Annex I of the Habitats Directive lists natural habitats whose conservation requires the designation of Special Areas of Conservation. Annex II lists species of plants and animals whose habitats must be protected for their survival. Annex III lists criteria for selecting sites eligible for consideration as "Sites of Community Importance" and designation as Special Areas of Conservation, while Annex IV lists species of Union interest in need of strict protection. Annex V lists species of plants and animals of Union interest whose taking from the wild and exploitation is subject to management, and Annex VI lists prohibited methods and means of capture and killing of mammals and fish, and prohibited modes of transport. In anticipation of the 2004 enlargement of the EU, the Annexes of the Habitats Directive were modified by the Act of Accession signed in Athens on 16th April 2003, to take into account the expanded geographical area of the EU15+10.

of conservation) of the local Flora, Fauna and Natural Habitats Protection Regulations, 2003.

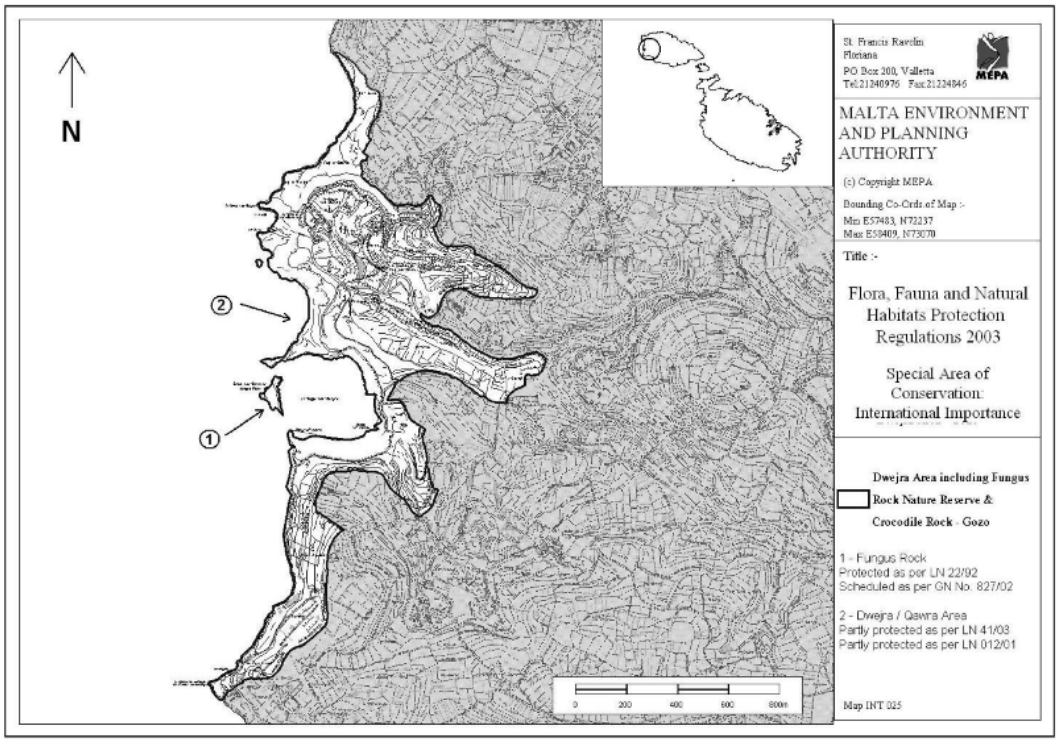

Figure 2: Map INT-025 showing the boundaries of the "*Dwejra-Qawra Area, inkluz Hagret il-General*" designated as a "*Special Areas of Conservation – Candidate Site of International Importance*", reproduced from Government Notice 877 of 2003 issued in terms of the Flora, Fauna and Natural Habitats Protection Regulations, 2003. The entire SAC is included with the study area surveyed here.

The wied at Tal-Port and its various tributaries qualify for protection as an AEI as per MSP policy RCO10 (9). The head of the wied to the west of Ta' Spiteri, appears to have a permanent spring fed by seepage from the surrounding rock face and thus qualifies for protection as an AEI as per MSP policy RCO10 (1), as well as an SSI as per MSP policy RCO11 (5) due to the presence of important palaeontological deposits. The permanent freshwater pool at the mouth of the watercourse at Tal-Port qualifies the site for protection as an AEI in terms of MSP policy RCO10 (6).

The coastal cliffs rising all along the entire western coast of Gozo, qualify for protection as an AEI in terms of MSP policy RCO10 (8) and as a SSI in terms of MSP policy RCO11 (1,2,3,4 7 and 8.) even if no such designation has as yet been made.

6.4.2 Policies concerning species

Species of conservation importance that occur within the study area include all the Red Data Book listed species listed in the site descriptions above. Even if none of these species are threatened (RDB categories 'Endangered' and 'Vulnerable'). Mediterranean Heath *Erica multiflora*, Tree Spurge *Euphorbia dendroides*, Maltese Everlasting *Helichrysum melitense* Maltese Hyoseris *Hyoseris frutescens*, Maltese

Stocks *Matthiola incana* ssp. *melitensis*, Maltese Cliff Orache *Cremnophyton lanfrancoi*, Olive-Leaved Bindweed *Convolvulus oleifolius*, Maltese Sea-Lavender *Limonium melitensis*, and Mediterranean Thyme *Thymbra capitata* are of particular importance as they are listed in Schedule II (Animal and plant species of interest whose conservation requires the designation of Special Areas Of Conservation) of the Flora, Fauna and Natural Habitats Protection Regulations, 2003.

The Maltese Wall Lizard (*Podarcis filfolensis maltensis*), the Moorish Gecko (*Tarentola mauritanica*) and the Turkish Gecko (*Hemidactylus turcicus*) which are known to occur in sthe study area, as well as all other local reptiles, are protected species under regulations[7] originally issued in terms of the Environment Protection Act (1991) and now subsumed by the Environment Protection Act (2001)[8]. Additionally, the Maltese Wall Lizard (*Podarcis filfolensis maltensis*) and the Sicilian Shrew *Crocidura sicula calypso* (which has not been recorded from the study area but which may possibly occur) are also listed in Schedule II (Animal and plant species of interest whose conservation requires the designation of Special Areas Of Conservation) of the Flora, Fauna and Natural Habitats Protection Regulations, 2003.

The Maltese Wall Lizard (*Podarcis filfolensis*) and the Sicilian Shrew (*Crocidura sicula*) are listed in Annex IV (Animal and plant species of community interest in need of strict protection) of the Habitats Directive as amended by the Athens Act of Accession. The Maltese Wall Lizard (*Podarcis filfolensis*) is listed in Appendix II of the Bern Convention[9] and the Turkish Gecko (*Hemidactylus turcicus*) and the Moorish Gecko *Tarentola mauritanica* are listed in Appendix III of the same convention.

All endemic species occurring within the study area are protected species in terms of Regulation 20 of the Flora, Fauna and Natural Habitats Protection Regulations, 2003 and therefore cannot be deliberately picked, collected, cut, uprooted, destroyed, pursued, taken damaged, captured, or killed. Note that as defined by these regulations, 'endemic' refers not only to those species that occur solely within the Maltese archipelago, but includes all species whose native distribution range is limited to the Central Mediterranean region where 'Central Mediterranean' is taken to include Southern Italy (all Italian territory south of Florence), Sardinia, Corsica, Sicily and circum-Sicilian islands (including Pantelleria and the Pelagian Islands), the Maltese Islands, Tunisia and islands off Tunisia. Moreover, 'endemic species' also includes possibly endemic species whose taxonomic status or identity requires further analysis. Regulation 20 does not apply to those endemic species listed in Schedule VIII of the Flora, Fauna and Natural Habitats Protection Regulations, 2003. In practical terms, these regulations apply to most of the species listed as either 'Endemic' or 'Rest (Med)' in the species lists presented in this report, with the exception of *Carlina involucrata*, *Urginea pancration*, *Anthemis urvilleana*, *Chiliadenus bocconei*, and *Phagnalon graecum* ssp. *ginzbergerii* which are listed in Schedule VIII.

[7] Reptiles (Protection) Regulations, 1992 - Legal Notice 76 of 1992.

[8] The Flora, Fauna and Natural Habitats Protection Regulations, 2003 also list all local reptiles and the Sicilian Shrew (*Crocidura sicula*) under Schedule V 'Protected Fauna'.

[9] The Bern Convention is the *Convention on the Conservation of European Wildlife and Natural Habitats*. Appendix II lists strictly protected fauna species and the Convention prohibits the deliberate capture, the destruction of breeding or resting sites, the deliberate destruction or taking of eggs and the deliberate killing of and trade in these species. Appendix III of the Berne Convention lists protected species of fauna that can be exploited. Parties are obliged to keep these species out of danger by introducing various conservation measures.

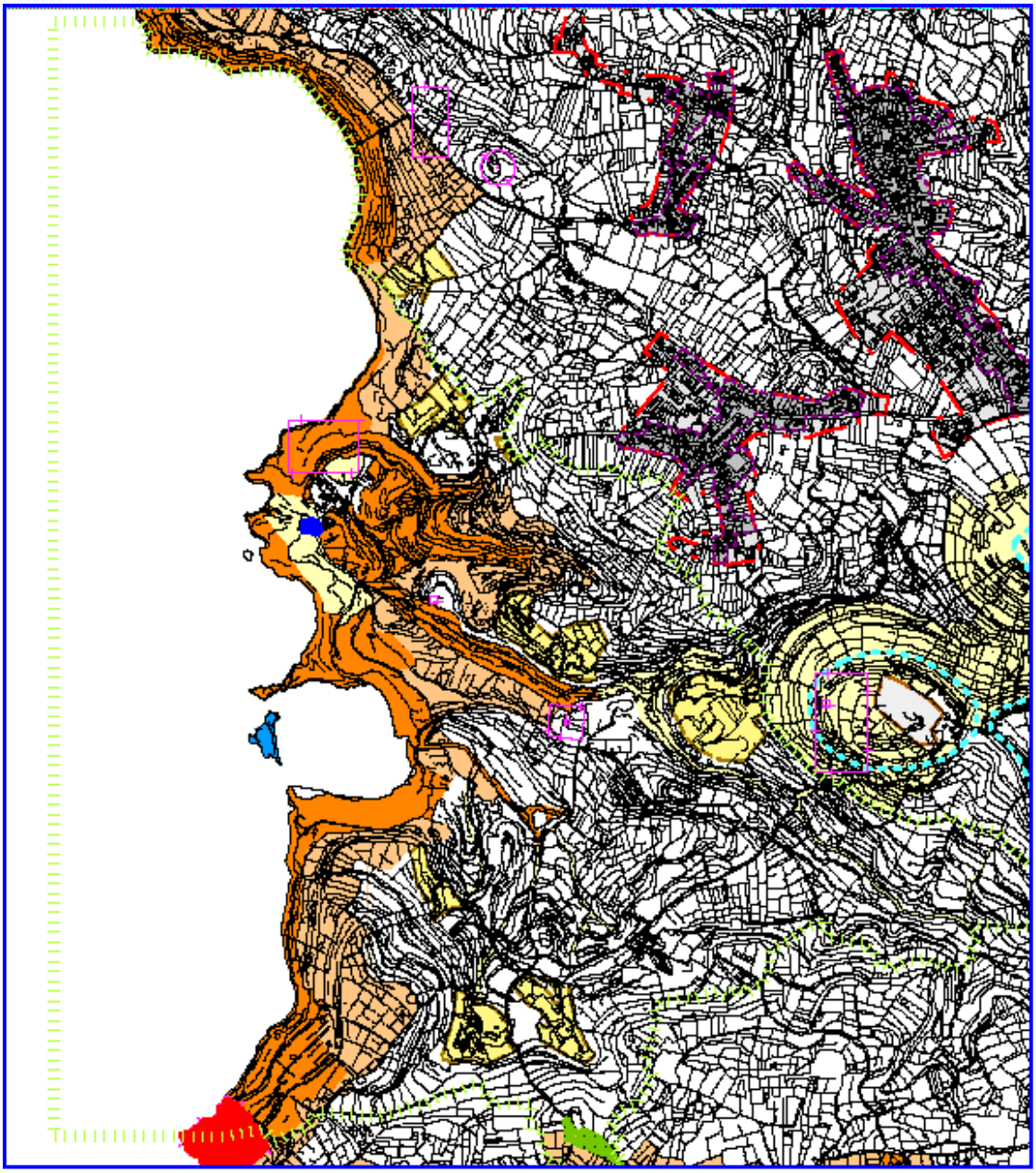

Figure 3: Excerpt from Map 14.10-E of the draft Gozo and Comino Local Plan (2002) showing the boundaries of the proposed Qawra/Dwejra Heritage Park (green dashed line), and proposed Level 1/Level 2 (orange shading), Level 3 (pink shading) and Level 4 (light yellow shading) AEIs/SSIs. The area shaded in red is the proposed Ras il-Wardija Archaeological Site. The green shaded area in the extreme south is L-Ghadira ta' Sarraflu. Dark yellow shading indicates soft-stone quarries.

A number of trees and shrubs present within the study area are protected under the Trees and Woodland Protection Regulations, 2001[10]. Maltese Salt-Tree (*Darniella melitensis*) and Tamarisk (*Tamarix africana*) are listed in Schedule I (Strictly Protected Trees) of these Regulations; Olive (*Olea europaea*), Carob (*Ceratonia siliqua*) and Pomegranate (*Punica granatum*) are listed in Schedule II (Protected Trees) of these regulations. On the other hand, these same regulations list Blue-

[10] Legal Notice 12 of 2001.

leaved Wattle or Acacia (*Acaia saligna*) as an invasive or damaging species for the environment (Schedule V).

6.4.3 Other policies

The wied systems in the study area particularly Wied il-Kbir/Wied Pisklu/Wied Ilma with their tributaries and the system opening into Il-Port (the Dwejra depression) are important runoff channels and water catchment areas and as such these widien qualify for protection by virtue of MSP Policies RCO28 and RCO29.

The clay slopes at Il-Qawra are prone to erosion and therefore MSP policies RCO21, RCO22, RCO26 and RCO27, which provide for the prevention of any further loss of clay, apply.

Although the assessment of agricultural value is not within the scope of the present assignment, in the present consultants' opinion, the cultivated land within the study area comprises good quality agricultural land and as such may qualify for designation as an Area of Agricultural Value (AAV) as per MSP Policy RCO1:1. In case of such a designation, then MSP Policies RCO7, RCO8 and RCO9 will apply.

6.4.4 Gozo and Comino Local Plan (GCLP) policies

The GCLP is presently in the public consultation stage (MEPA, 2002[11]), before a final revised version is adopted and becomes part of local planning legislation. The following GCLP policies concerning the ecological resource in the study area are relevant.

GCLP policy GZ-Slwz-1 indicates an area on the western coast of Gozo marked on GCLP MAP 14.10-E shall be designated as the Qawra/Dwejra Heritage Park[12]. Sites within this Heritage Park shall be protected as Areas of Ecological Importance, Sites of Scientific Importance, Areas of Archaeological Importance and as Areas of High Landscape Value as appropriate. The Qawra/Dwejra Heritage Park shall be managed according to the provisions of clauses 15.34 to 15.40 of the Explanatory Memorandum of the Structure Plan and according to criteria of the World Conservation Union (IUCN) and as a candidate World Heritage Site.

GCLP policy GZ-Slwz-1 further stipulates that to achieve the above, a management committee shall be set up under the coordination of MEPA, so as to oversee the formulation and implementation of a detailed Management Plan. The Management Plan for the area shall address issues such as responsibility for management, maintenance and upkeep, interpretation facilities, organization of land-use activities and monitoring of changes and their impact. It shall also be entrusted to oversee the interpretation of the various areas through appropriate facilities on site, rationalized visitor management, restoration of damaged landscapes, promotion of well signed visitor routes, the removal of illegal structures built after the Planning Authority was set up as documented on aerial photography and other compatible interventions.

It-Torri tad-Dwejra (or tal-Qawra) situated between the Dwejra (Il-Port) and Qawra subsidence structures has been restored but no specific function has been assigned to it. GCLP policy GZ-Slwz-3 proposes to utilize the tower as an Interpretation Centre for the Qawra/Dwejra Heritage Park.

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[11] MEPA (2002) *Gozo and Comino Local Plan. Draft land-use policies for public consultation*. Floriana, Malta: Malta Environment & Planning Authority; 158pp + appendices + maps.

[12] The area indicated GCLP MAP 14.10-E as the Qawra/Dwejra Heritage Park is the same area which is the subject of the present study and which is referred to in this report as 'the study area'.

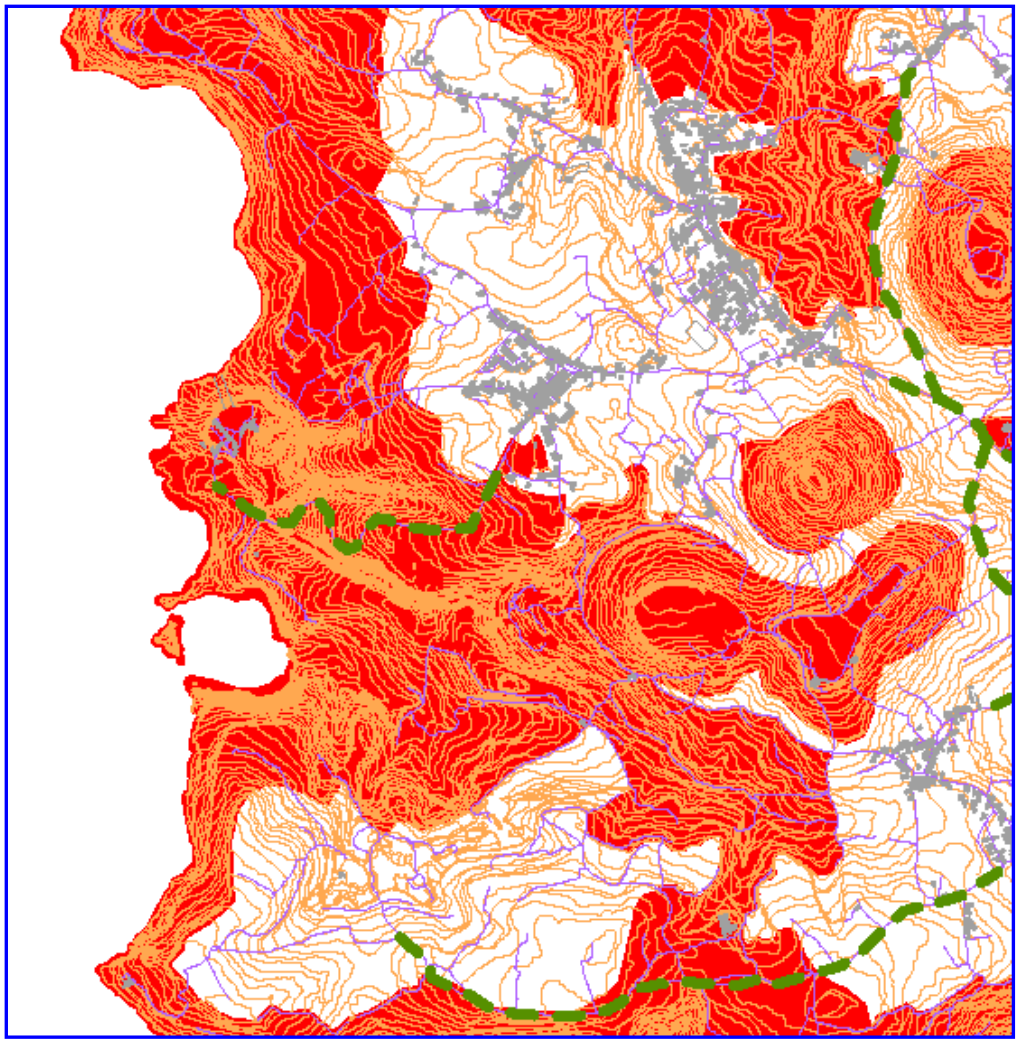

Figure 4: Excerpt from Map MAP 13.1-B of the draft Gozo and Comino Local Plan (2002) showing Areas of High Landscape Value (red shading) on the west coast of Gozo subject to policy GZ-RLCN-1.

GCLP policy GZ-Slwz-4 provides for the rehabilitation of disused quarries in the Qawra/Dwejra area through infill and subsequent conversion to agriculture. It presumes against the lateral extension of quarries in this area, except for extensions directed away from the Qawra/Dwejra Heritage Park area (provided that the extensions do not infringe upon other protected areas and sites) and screened from long distance views into the site. It further states that all applications for such extensions shall be subject to an Environmental Impact Assessment.

Specific sites with the study area are proposed for designation as AEIs and SSIs by GCLP policy GZ-RLCN-1. These sites are indicated on GCLP MAP 13.1-A (showing the whole island of Gozo) and MAP 14.10-E (showing the western coast of Gozo).

In addition, GCLP policy GZ-RLCN-1 stipulates that all the minor islets (including General's Rock) and the areas indicated on GCLP MAP 13.1-B shall be designated as Areas of High Landscape Value (AHLVs).

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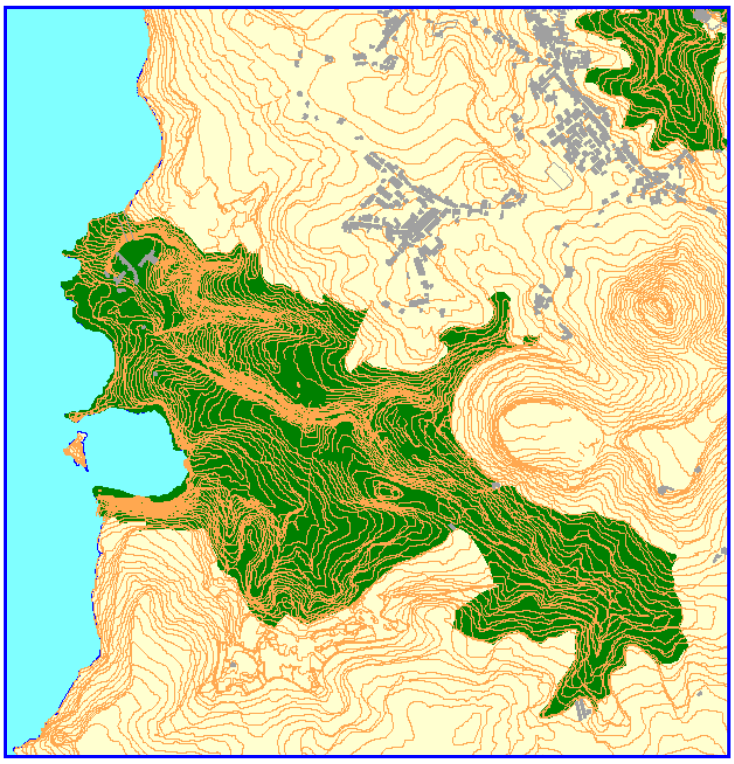

Figure 5: Excerpt from Map MAP 13.2 of the draft Gozo and Comino Local Plan (2002) showing Category A valleys (green shading) on the west coast of Gozo subject to policy GZ-RCLN-2. No Category B valleys are present in this area.

The GCLP recognizes widien as a valuable national resource in terms of water resources, agriculture, wildlife, landscape, soil conservation and leisure. It also classifies the Gozitan widien into two categories: V-shaped valleys and U-shaped valleys. V-shaped valleys are those that have fairly steep slopes all the way from the ridge edges to the watercourse; these types of valleys tend to be narrow and often, the slopes are so steep that cultivation is either difficult or impracticable. U-shaped valleys tend to be wider and a significant proportion of the valley floor tends to be dominated by a gentler slope; the lower areas are generally heavily cultivated. Malta Structure Plan policies RCO 28 and RCO 29 are intended to safeguard valleys; however, the different topography of the two main valley types implies that the policy framework for the two types should be slightly different. Therefore, since with V-shaped valleys the physiography tends to promote scenic qualities which have a high natural component, the provisions of MSP policy RCO 29 are adopted *in toto* for this type of valley. On the other hand, the heavily cultivated valley floors and the extent of U-shaped valleys, call for special provisions to be made to permit the continuation of traditional cultivation whilst safeguarding the natural and cultural features of these landforms. For policy purposes therefore, the GCLP calls V-shaped valleys Category A Valleys and U-Shaped valleys are classified as Category B Valleys.

GCLP policy GZ-RCLN-2 indicates the two categories of valleys on a map base (GCLP MAP 13.2) and states that Category A Valleys are fully subject to the provisions of Malta Structure Plan policy RCO 29. It further states that Category B Valleys are also generally subject to the provisions of MSP policy RCO 29 but with some flexibility in terms of road upgrading, services upgrading, wind-pumps, small stores, reservoirs and other limited facilities which are deemed necessary for the continuation of traditional agricultural practices.

All the widien within the study area are designated as Category A valleys and therefore fully subject to the provisions of MSP policy RCO29.

GCLP policy GZ-RLCN-3 provides for a general presumption against any form of development on garrigue in Gozo, including reclamation for cultivation purposes, while GCLP policy GZ-RLCN-4 provides for a general presumption against the passage of services through garrigue. Garrigue areas subject to these two policies are identified in GCLP MAP 13.3, which indicates the presence of a significant garrigue cover within the study area.

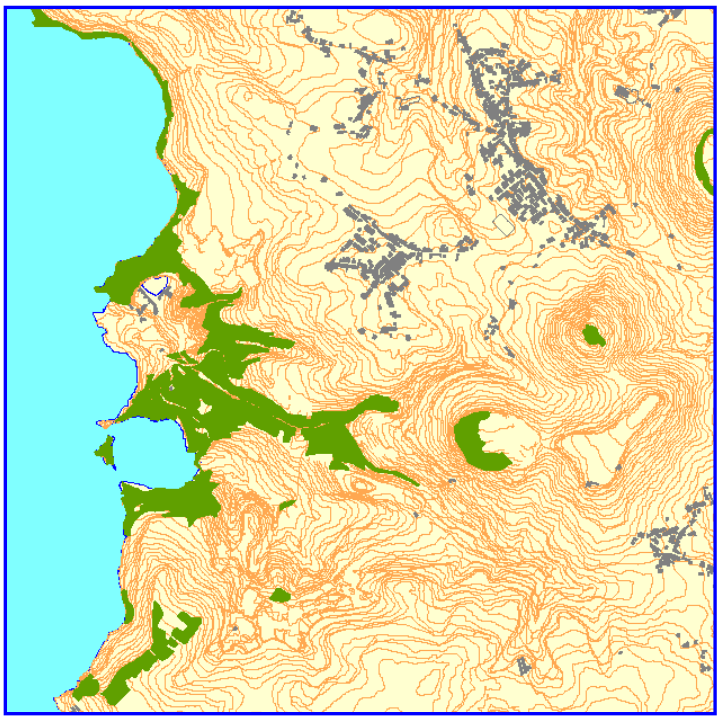

Figure 6: Excerpt from Map MAP 13.3 of the draft Gozo and Comino Local Plan (2002) showing garrigue areas (green shading) on the west coast of Gozo subject to policies GZ-RLCN-3 and GZ-RLCN-4.

GCLP policy GZ-COAS-3 concerns islets and rocks around Gozo and Comino and states that pending their formal scheduling as Areas of Ecological Importance and/or Sites of Scientific Importance, all minor islets and rocks identified are afforded protection for their ecological, scientific, geological, geomorphological and aesthetic value and that all development on these islets and rocks is hereby strictly prohibited and access to them shall be controlled and kept to the barest minimum. This same policy specifically states that Fungus Rock (General's Rock) shall continue to be protected as a Strict Nature Reserve and access to it shall be governed by the provisions of LN 22 of 1992.

The GCLP has a specific policy concerning Ras il-Wardija which lies partly within the present study area. GCLP policy GZ-Slwz-6 specifies that the site at Ras il-Wardija shown on GCLP MAP 14.10-E shall be protected in view of its considerable archaeological, ecological and scenic value.

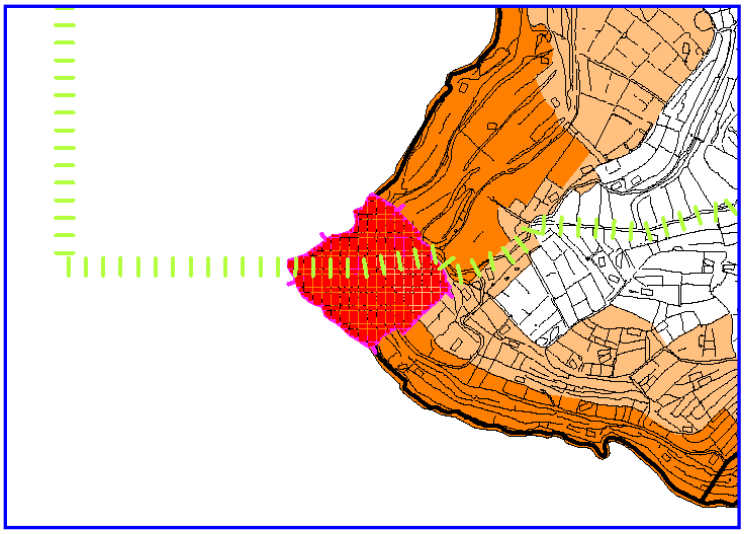

Figure 7: Excerpt from Map 14.10-E of the draft Gozo and Comino Local Plan (2002) showing the Ras il-Wardija Archaeological Site (shaded in red) proposed by policy GZ-Slwz-6. The boundaries of the proposed Qawra/Dwejra Heritage Park are shown as a green dashed line. Orange shading indicates Level 1/Level 2 AEIs/SSIs and pink shading indicates Level 3 AEIs/SSIs.

The GCLP also has a specific policy concerning L-Ghadira ta' Sarraflu. GCLP policy GZ-Kerc-3: According to ths policy, L-Ghadira ta' Sarraflu shall continue to be protected as a site supporting a unique freshwater ecosystem and the area around the site shall be promoted as an informal recreational site and an educational resource. Access to the water is discouraged to reduce the likelihood of damage to the fragile pool ecosystem.

The GCLP acknowledges the popularity of diving as a recreational activity and as a specialized form of tourism and recognizes that Gozo offer underwater features and the clear waters that attract both local and tourist divers. The GCLP specifies four main diving on Gozo, including the Qawra/Dwejra Area (see GCLP MAP 3.1). GCLP policy GZ-RECR-2 states that MEPA will encourage the creation of swimming zones as well as the zoning of other marine related activities in order to minimize conflicts and increased safety measures in heavily used bays and that MEPA shall also support the Malta Maritime Authority and the respective Local Councils in the formulation of Marine Area Management Plans for these localities.

The GCLP recognizes that agricultural land in Gozo is threatened by a number of forces that are resulting in its decline, which in turn is causing degradation and a change in the traditional landscape and rural character of Gozo.

GCLP policy GZ-AGRI-1 requires MEPA to safeguard Areas of Agricultural Value, which are indicated on GCLP MAP 11.2 and requires that requests for development permission for agriculture related development in these areas which will result in the subdivision of agricultural land, will be refused. A significant proportion of the agricultural land within the study area is recognized as having agricultural value (see GCLP MAP 11.2).

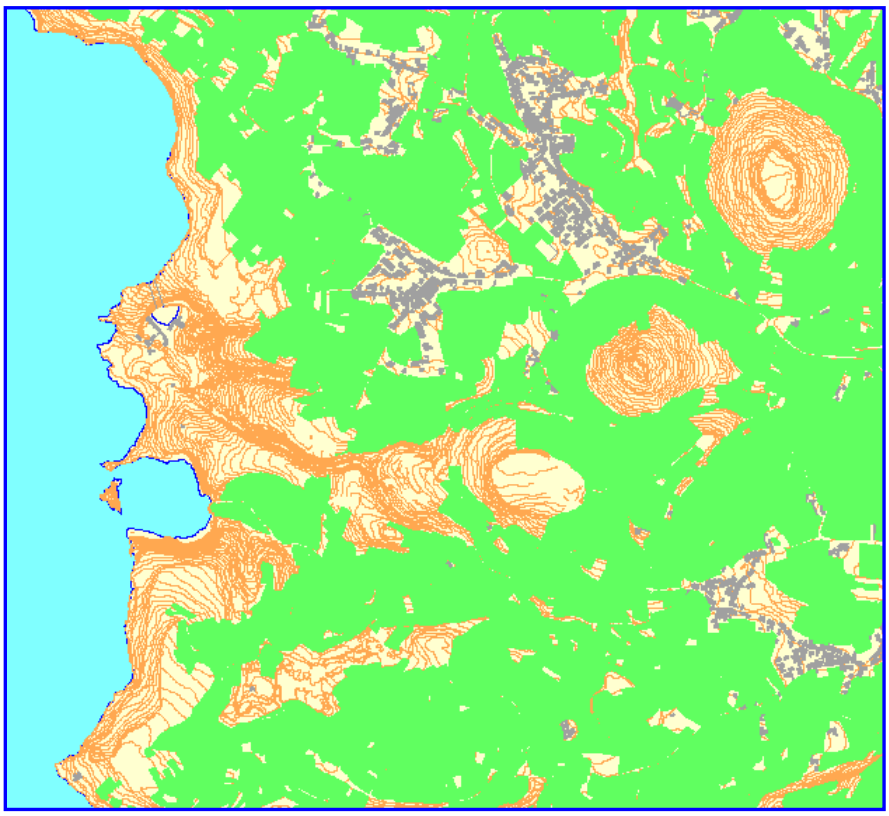

Figure 8: Excerpt from Map MAP 11.2 of the draft Gozo and Comino Local Plan (2002) showing Areas of Agricultural Value (green shading) on the west coast of Gozo subject to policy GZ-AGRI-1.

The GCLP considers rubble walls to be an important characteristic of the Gozitan rural landscape but also that there are pressures to replace traditional rubble walls with ashlar block walls. GCLP policy GZ-AGRI-7 states that MEPA shall encourage the rehabilitation of existing rubble walls which lie in a state of disrepair. This policy has important ecological implications since rubble walls constitute an important habitat for wildlife including numerous reptiles and invertebrates.

Abandoned agricultural land, particularly that which has been abandoned for a long time and has become colonised by vegetation to form an incipient steppe or a secondary maquis, also constitutes and important habitat for a number of plants and animals. In this regard, GCLP policy GZ-AGRI-8 also has ecological implications. This policy states that MEPA in conjunction with the Department of Agriculture, will initiate the preparation of management plans for the reinstatement of abandoned agricultural land to traditional cultivation.

The GCLP identifies a number of rural areas in Gozo as degraded areas and therefore as candidates for rehabilitation in terms of MSP policies RCO 19 and RCO 20. GCLP policy GZ-RLCN-5 indicates such areas on GCLP MAP 10.3.3. However, no such areas are identified on this map as present within the boundaries of the present study area.

Additionally, the GCLP idenfies a number of sites for afforestation, based on the provisions of MSP policy RCO 31. GCLP policy GZ-RLCN-6 states that afforestation projects should be treated as ecological projects including the creation of the entire habitat type and not treated as monocultures. Areas to be considered for the siting of

such afforestation projects are shown in GCLP MAP 13.4, however, no such areas are identified as present within the boundaries of the present study area.

Potential 'Natural Habitat Types of Community Interest' as per the EU's 'Habitats Directive'.

A number of habitat types present within the study area may qualify as "Natural Habitat Type of Community Interest", the conservation of which would require the designation of a Special Area of Conservation as per the provisions of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora [OJ L 206, 22.7.1992, p. 7] as amended by Council Directive 97/62/EC of 27 October 1997 [OJ L 305 8.11.1997, p.42] and the Act concerning the conditions of accession of the Czech Republic, the Republic of Estonia, the Republic of Cyprus, the Republic of Latvia, the Republic of Lithuania, the Republic of Hungary, the Republic of Malta, the Republic of Poland, the Republic of Slovenia and the Slovak Republic and the adjustments to the Treaties on which the European Union is founded [OJ C 241 29.8.1994, p. C 241 21 29.8.1994] (the 'Habitats Directive' as it now stands after 01 May 2004). Such habitats are listed in Annex I of the Directive and include the following main or subcategories (the code numbers are Natura 2000 codes as given in Annex I; an asterisk indicates a 'priority habitat'

1160 Large shallow inlets and bays

12. Sea cliffs and shingle or stony beaches

1240 Vegetated sea cliffs of the Mediterranean coasts with endemic *Limonium* spp.

14. Mediterranean and thermo-Atlantic salt marshes and salt meadows

3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

3170 * Mediterranean temporary ponds

5330 Thermo-Mediterranean and pre-desert scrub

54. Phrygana

6220 * Pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea*

8130 Western Mediterranean and thermophilous scree

8140 Eastern Mediterranean screes

8210 Calcareous rocky slopes with chasmophytic vegetation

8240 * Limestone pavements

8330 Submerged or partially submerged sea caves

7 PRINCIPAL SOURCES OF ANTHROPOGENIC IMPACT IN THE AOS

Various sources of environmental stress, both explicit as well as implicit, were noted from the AoS. Such sources included the following:

1. Rock quarrying

Extensive patches within the AoS have been quarried for stone. Such activities have obviously obliterated all surface habitats within the quarried area with consequent loss of species and severe degradation of geological and geomorphological resources.

2. Redistribution of sediment from quarries: fine sediment

Fine particulate arising from quarrying (both within as well as outside the AoS) may be subject to wind-borne transport and would be expected to enter adjacent habitats. Particulate entering the soil may have a very long residence time, although given the high limestone content of local soils the addition of limestone dust to soil is not expected to have any significant effects. Increased fallout of particulates may coat the photosynthetic organs of plants leading to reduced incidence of light on these surfaces, with subsequent reductions in efficiency of photosynthesis, transpiration and thermoregulation. A light coating of particulate on plant surfaces may presumably be removed by rainfall. The most ecologically important parts of the AoS are the coastal components and these are the least affected by deposition of dust given that the coast is one of the most exposed in the Maltese Islands and that the prevailing winds blow from offshore.

3. Redistribution of sediment from quarries: coarse spoil

Coarse debris was generally deposited in large, unconsolidated mounds along the fringes of quarried areas, some in close proximity to valley systems. Apart from a negative visual impact on landscape, such accumulations have taken up large tracts of habitat, replacing an indigenous substrate with one that is relatively homogenous and structurally unstable. The provision of fresh habitat and removal of competition has provided opportunities for colonisation of these mounds by invasive opportunistic species (popularly referred to as 'weeds' but technically know as ruderals). The pool of such opportunistic species exploiting these habitats would subsequently serve as a reservoir of propagules for colonisation of transient gaps in adjacent habitats.

Coarse spoil has also been observed to spill over into adjacent habitats including the major valleys of the AoS as well as the environs of the Inland Sea. The entry of significant quantities of rubble (and products of its erosion) into valley systems increases sediment loads within the valley bed and provides a direct threat to aquatic habitats including temporary pools and lotic stretches (i.e. those with flowing water).

4. Exploitation of cliff face

Various cliff faces in the AoS, including the sheer face overlooking the wetland at Il-Qattara have been utilised for recreational abseiling. Use of entrenching implements, repeated mechanical impact and abrasion provide a direct threat to rupestral assemblages colonising the cliff face.

5. Trapping areas

A considerable number of bird-trapping grounds (*mnasab*) were noted from the AoS. Apart from impact on avifauna, construction of trapping grounds generally involves clearance of vegetation and levelling of the substratum with consequent eradication of species occupying the affected area. Several trapping grounds were constructed on derelict agricultural land whilst others were established on areas in intermediate stages of old-field succession. Removal of the established vegetation provides gaps for invasive opportunistic species, providing a pool of propagules from where subsequent entry into adjacent communities may proceed.

6. Introduction of exotic plants for bird shooting or landscaping

Various parts of the AoS were colonised by exotic plants, particularly Eucalypts. Small monospecific Eucalypt woodlots have been planted on agricultural areas in order to attract targets for bird-shooters. Other alien species, including Hottentot Fig *Carpobrotus edulis* and Century plant *Agave americana*, have been introduced for ornamentation. The principal point of entry of *Carpobrotus edulis* appears to be the environs of St Anne's Chapel overlooking the Inland Sea. Introduction of Hottentot Fig along the walls of the chapel has promoted invasion into the adjacent halophyte assemblage.

7. Introduction of exotic animals into aquatic habitats

The accessibility of the permanent freshwater habitats tends to encourage deliberate introduction of exotic fauna, ostensibly for embellishment or recreation. Exotic species known to have been recorded from the freshwater pool at Il-Qattara include Goldfish, whilst exotic fauna introduced into L-Għadira ta'Sarraflu include Western Mosquitofish (*Gambusia* sp.) and frogs (*Rana* sp.). Exotic fish are depleting invertebrate populations in these pools whilst *Rana* sp. is in direct competition with the local Painted Frog *Discoglossus pictus pictus* [RDB: V, Rest (MED+MI)] as it is known to prey on its juveniles and tadpoles. Two terrapins are also known to have been recently released into the Ta' Sarraflu pool.

8. Encroachment on friable geological resources

Poorly-consolidated geological resources, particularly the Pleistocene colluvium at Il-Qawra, may be subject to increased rates of erosion as a consequence of encroachment. Frequent trampling tends to break up surface encrustation and displace any binding vegetation, releasing fresh surfaces for erosion.

9. Bird shooting

Bird shooting activity has been observed in most parts of the AoS, the status of the area as a bird sanctuary notwithstanding.

10. Traditional folk-fairs at Id-Dwejra and L-Għadira ta'Sarraflu

Organisation of such fairs invariably attracts large crowds to these parts of the AoS increasing localised incidence of waste accumulation and encroachment on habitat and vegetation as well as trampling of vegetation due to the increased demands for car-parking space.

11. Pitching of tents outside designated sites

Two large camping units have been installed at Il-Qawra for several weeks, in the immediate vicinity of the freshwater pool at Il-Qattara while in past years tents were pitched on the plateau capping the Quaternary deposit. Pitching of tents outside designated sites would generate opportunities for land-clearance, trampling, waste disposal and introduction of pollutants into habitat. It has been noted that facilities for barbecuing have been installed in the vicinity of Il-Qattara, creating an obvious risk of uncontrolled fire in the area while campers were also observed using water from the Qattara pool for domestic needs.

8 GENERAL RECOMMENDATIONS FOR MANAGEMENT

8.1 General

The general management strategy that we are advocating for the study area as a whole (the Qawra/Dwejra National Park) is one of minimum intervention. The only interventions required in most of the area are: zoning and physical delimitation of the zones, clearing away rubbish and dumped material, repair of existing structures, redesign of access and the track/footpath network, weeding (particularly to control exotic species and protect indigenous ones from excessive competition), and selective planting where degraded landscapes need to be rehabilitated (e.g. the quarried areas). Given adequate protection, accomplished through a pro-active and integrated management programme, conservation areas will enhance the social, aesthetic and cultural fabric of the AoS and its surroundings, in addition to conserving biotopes and providing a suitable venue for environmental education and research. Moreover, such protected areas as the Qawra/Dwejra National Park should encourage an element of economic activity, e.g. specialised rural and eco-tourism.

8.2 Zoning

It is suggested that management of the site should be based on the zoning of the area into 'management units' and the formulation of specific action plans for each, such that the objectives of the particular type of management unit are achieved. For example, while the area around the car park would be one management unit where the objective would be ‘recreation with as little impact on the environment as possible’, the area around the tower would be another with ‘visitor presentation’ as its main objective, etc.

No attempt was made in this study to actually suggest designation of particular areas as management categories, since such designation should take into consideration not only the ecological resource (the subject of this study), but also other features, including geological, geomorphological and landscape features, archaeological sites, and traditional human activities. Such designation of management units will presumably be the concern of the overall management plan for the whole area, currently being formulated and for which the present report provides input.

However, the following general recommendations concerning management units within the study area boundaries are offered as suggestions:

- The objectives for each management unit should be clearly defined, and a detailed action plan drawn up for each. These action plans should include measures regarding such issues as resource use, cleaning, rehabilitation (where this is deemed necessary and following appropriate study), public access, general maintenance, the setting up and securing of site boundaries and resolution of any ensuing conflicts.

- Past experience shows that it is unlikely that legal protection and the setting up of rules and regulations alone will protect a site, or that a management plan can be implemented without the constant surveillance of field officers. Therefore, it is strongly recommended that a wardening system be set up. This may be an *ad hoc* system or may make use of existing wardening services; however, wardens should receive special training in local environmental and planning legislation and its enforcement, as well as in basic ecology with special reference to the study area (the Qawra/Dwejra National Park, if the study area is designated as such). Moreover, some training in public relations, stakeholder negotiation and conflict resolution may also come in useful.

- Zoning for management purposes needs to be undertaken during the early phase of the process, so that any activities within the different segments can be planned and, if necessary, controlled according to defined objectives. Intensive management practices may be required in some sectors of the AoS, while other sectors may require less attention. Zoning would allow a better understanding and protection of core areas and buffer zones, while necessitating the monitoring of human impact, and efficient allocation of resources such as personnel, equipment and funds.

8.3 Areas reserved for 'visitor presentation'

Certain areas within the site should be primarily used for public presentation. This does not mean that people are left to wander about without any guidance or supervision whatsoever, nor are these areas meant for hikes. Such public presentation areas should be designed for attracting cultural/nature tourism and to have an educational role.

Obviously, these areas for public presentation must be managed, if their features of interest and their educational role are to co-exist in the long term. We offer the following guidelines about management objectives and actions for these 'areas for public presentation':

1. Conservation of indigenous plants and animals, their habitats and the immediate landscape;
2. Regeneration of native vegetation communities in appropriate areas, by removing factors that are causing the degeneration of the vegetation;
3. Protection of the cultural heritage (for example: traditional agriculture, vernacular architecture, archaeological and historical sites or other heritage features);
4. Visitor education through sign-posted nature trails and a permanent exhibition (e.g. in a visitor centre for which, the Tower may be an ideal setting).

8.4 Other recommendations:

In putting forward our recommendations for actions necessary to protect and manage the study area, our philosophy is one of management by the least amount of interference and habitat modification (other than stopping or reducing, as much as possible, the activities resulting in negative impacts on the habitat), cleaning, and the removal of obtrusive or incongruous elements, including alien biota.

- Zones and routes should be clearly marked (for example by using wooden stakes, or embedded stones), sign-posted, provided with boards at key points explaining to the visitor what there is to see, and regularly maintained. Natural materials should be used whenever possible.

- In particular, footpaths, nature trails and other visitor facilities in ecologically sensitive areas should be clearly marked and signposted in order to prevent users from wandering off onto the sensitive and/or important habitats.

- **Degraded** areas should be improved by first identifying the factors causing degradation and controlling them, and then by **sensitive** habitat engineering such as selective weeding and the surgical planting of appropriate vegetation. Any habitat engineering work should be done under supervision of qualified persons and only following approval of a method statement. On the whole, however,

habitat engineering should be used as a last resort and to the bare minimum necessary.

- Dry stone walls which have collapsed should be rebuilt and other structures (for example, rural buildings) repaired. The original material and traditional methods should be used. No attempt should be made to remove natural features (for example, boulders or stone screes) to 'improve' the area, as these provide important habitats and refugia for many species.

- New dry stone walls may be built in order to control soil erosion where appropriate. Traditional materials and methods of construction should be used.

- Only existing footpaths, tracks and roads should be utilized. At present there are a large number of tracks criss-crossing all areas. Some of these allow vehicular access to otherwise relatively inaccessible sites. Consideration should be given to eliminating some tracks and associated clearings.

- Likewise, many of the footpaths that traverse each area are unnecessary and should be eliminated. What should remain is a carefully thought out route or routes through each area which would allow visitor access to all the interesting features present.

- Any development other than footpaths, nature trails, information points, lookouts and similar amenities should be strictly controlled.

- All structures need to be protected from the elements and from vandalism. Random stone walls should be regularly maintained. Strict control on the activities of trappers and of people who collect capers and snails for consumption, both of whom regularly demolish such walls, should be exercised.

- The status of all ecologically sensitive sites should be continuously monitored and immediate remedial action should be taken if the habitat of other natural feature starts showing signs of deterioration.

- We are strongly of the opinion that the objectives of conservation and environmental education will only be achieved if there is some degree of supervision of each site. This can be provided by specially trained personnel who may also be able to offer guided tours of the area. This service may be provided by the Local Councils responsible for the locality, in collaboration with Government agencies.

- Agriculture, especially that practised in the traditional manner, has, since the earliest days of human settlement on the islands, been a key factor in shaping the landscape. Traditional agriculture should therefore be encouraged and efforts made to bring **recently** abandoned agricultural land back into cultivation, especially that with good agricultural potential. This does not include that land that has been abandoned for such a long time that it has lost its soil cover and is now vegetated by steppic and garigue communities (and in some cases, also by maquis elements).

- So far as is possible, soil should not be disturbed or transported within ecologically sensitive areas. Any disturbed soil is likely to become rapidly invaded by weeds to the detriment of the natural vegetation, apart for the danger of soil erosion.

- A general clean-up of the areas should be organised. It is important that such an operation be carried out under supervision (to prevent the excessive removal of

important ecosystem components such as leaf litter) and using only small mechanical and hand tools. In ecologically sensitive habitats, cleaning should be done **by hand**, under the supervision of appointed qualified personnel. In particular, such clean-ups need to be made on the peripheries of quarries and construction sites, and of roads. Before any major cleaning work is carried out in a locality known to be ecologically important, an ecological survey should be made, since existing information may be incomplete. Areas with species or groups of species of conservation importance, particularly if such species are rare and/or threatened, should not be cleaned at all, or disturbed in any way unless under expert guidance.

- Vegetation growing on the side of footpaths and country roads may be trimmed back but should not be extirpated completely as it provides a habitat for a number of species, mostly fauna, which are now found mainly in such habitats.

- All dredging and cleaning works in *widien* should only be carried out under supervision of qualified persons and only after a method statement has been drawn up and approved. Watercourses and *widien* sides should be cleaned **by hand** of all material deposited by storm water and dumped illegally, and should be kept free of such debris by periodic manual cleaning. Under no circumstances should watercourses and *widien* sides be cleaned by unselective mechanical means. Action to prevent future dumping should also be taken (wardening, screening the sides of roads flanking *widien*, and preventing vehicular access to *widien*, for example).

- Only essential dredging work to maintain the free flow of water should be permitted in those *widien* where silting of the channel will lead to problems of flooding or erosion, or where such dredging is necessary for the upkeep of dams. No dredging should be done where it is not necessary or where only accumulated rubbish needs to be cleared away. Such rubbish should be removed manually (see above). Only *widien* watercourses should, and need, to be dredged. Valley-sides need only be cleared of rubbish and indeed, dredging these would be detrimental, not only to biota but also as it would probably accelerate erosion of the *wied* banks.

- Wherever possible, dredging should be done using hand tools. Where this is not possible small mechanical shovels or dredgers may be used provided that they are of a type that will cause minimal interference with areas outside the actual site of operations. Any vehicles used for the dredging itself or to cart away spoil should gain access to the work site in such a way as to cause as little damage and trampling as possible to the valley-side communities.

- Rehabilitation of quarries and other disturbed areas may involve afforestation or the planting of vegetation as part of soft-landscaping. No alien/exotic plants should be introduced into rural areas and particularly into natural habitats. Only native or archaeophytic species **of local stock** should be used for afforestation. Landscaping in rural areas should also make use of indigenous and archaeophytic species of local stock.

8.5 General comments regarding Research, Environmental Education and Monitoring

One of the main reasons why nature conservation is insufficiently valued is due to inadequate awareness about the importance and benefits in sustaining

ecosystems. The dissemination of knowledge concerning nature conservation and the appreciation of semi-natural landscapes and adjoining biotopes, through public information and awareness programmes, could well be an important function.

Human resource capacity building is deemed a vital component in protected area management. Qualified personnel are needed for day-to-day management, coordination and implementation of research activities, environmental monitoring and other support activities essential to an effective system of conservation. Development of skills through training will increase job effectiveness in a number of resource management areas. In this regard, every effort should be made to provide appropriate opportunities by experienced trainers to improve the level of education and training through knowledge-based and vocational training, in order to enhance interdisciplinary competences.

With regards to the scientific research already carried out within the AoS over the years and the current rich knowledge base, it is recommended that new data be utilized for monitoring purposes. Controlled activities such as bird-ringing that would monitor movement of avifauna through the AoS on a continuous basis and the temporary trapping of vertebrate and invertebrate species using various techniques, together with regular field sessions to examine floral density and richness, will all contribute towards maintaining an up-dated database on the floral and faunal populations within the AoS. Such information would prove invaluable for management purposes, especially where physical interventions and mitigating measures may need to be implemented.

It is likewise important to monitor wider-scale conditions such as at the level of the biotope. Since it is acknowledged that the condition of the abiotic environment is crucial for the well-being of the suite of biota that depend upon it, monitoring, for example, water quality of the standing freshwater bodies and wetland areas on a regular basis is exceedingly important. Such monitoring data would provide long-term sequential information from which an assessment of the area's state-of-health could be carried out regularly.

8.6 Specific recommendations for management

1. Any options considered for management of the AoS should, at the very least, aim to maintain the present balance between exploitation of the area and conservation of natural resources.

2. It is therefore understood that any new constructions or any extension of existing ones should be considered unacceptable in this context. All constructions that have been erected without a permit should preferably be removed.

3. Given the floristic importance of the area, there should be a general presumption against introduction of invasive exotic species for landscaping or embellishment. Removal of existing aliens, particularly the Hottentot Fig in the vicinity of St Anne's Chapel at Qawra should be considered a priority in order to pre-empt any significant-scale invasion of neighbouring cliff habitats.

4. Management of spoil from quarried areas should proceed according to recommendations listed in EIA reports commissioned for sanctioning of quarrying activity. Furthermore, a strategic plan, in relation to Dwejra/Qawra

region, for the existing quarries' future exploitation, control and their subsequent restoration should be drawn up and implemented without further delay.

5. Utilisation of cliff face for sport climbing or abseiling should be restricted to designated areas in order to minimise damage to rupestral communities and cliff face.

6. Access to the plateau of the Pleistocene colluvium should, as far as possible, proceed along the present worn path. Superimposing a wooden walkway on this path would discourage encroachment on other parts of the deposit. Camping in this part of the area should be prohibited.

7. Ecological communities in freshwater habitats (such as L-Għadira ta' Sarraflu and Il-Qattara) are particularly fragile. Introduction of exotic species (such as frogs and fish) would alter community structure and would also represent a potential source of competition for local forms. Concerted efforts aimed at removal of alien species within the habitat and prevention of further introduction are necessary, although the implementation of such measures is unlikely to be straightforward. Use of the pool water or interference with the pool, the water seepage above it and the gallery in its vicinity, including drawing of water from these sources, should be prohibited.

8. Pitching of tents should be restricted to designated camping sites, which should not be close to the Il-Qattara pool or the Quaternary deposit.

9. Existing laws on bird shooting and bird trapping should be enforced and any illegal trapping sites should be identified and sensitively restored at the trapper's expense.

10. Bird-trapping, if at all permissible, should be restricted to derelict agricultural land that is in the early-pioneer stage of secondary succession. Clearance of undisturbed habitat should not be permissible.

11. Driving of off-road vehicles onto the coastal karstland, such as is regularly practiced by organised "adventure tours" should be actively discouraged and at most limited to designated sites.

Figure 9: General view of the sheer cliff face at Ta' Slima

Figure 10: Maltese Cliff Orache (*Cremnophyton lanfrancoi*) from cliff at Ta'Slima

Figure 11: General aspect of maritime steppe/garrigue formation at Ta'Slima

Figure 12: Maltese Everlasting (*Helichrysum melitense*) recorded from rdum communities.

Figure 13: Part of the bed of Wied il-Kbir, showing exposed bedrock and disturbed fringes.

Figure 14: Woodlot overlooking valley system. Mounds of construction debris are visible at various points.

Figure 15: Pennyroyal (*Mentha pulegium*) in the bed of Wied il-Kbir

Figure 16: General aspect of aerohaline community dominated by Shrubby Glasswort (*Arthtrocnemum macrostachyum*) and Golden Samphire (*Inula crithmoides*)

Figure 17: General aspect of the coastal fringe of the AoS from Ta'Slima (foreground) to il-Ponta tal-Wardija

Figure 18: General's Rock at il-Bajja tad-Dwejra

Figure 19: View of the coastal fringe of the Tal-Port area overlooking il-Bajja tad-Dwejra

Figure 20: Ermes community at Taċ-Ċnus dominated by Golden Samphire (*Inula crithmoides*) and Seaside Squill (*Urginea pancration*)

Figure 21: Ermes community dominated by Seaside Squill (*Urginea pancration*), Carline Thistle (*Carlina involucrata*) and Bushy Restharrow (*Ononis natrix ramosissima*)

Figure 22: General aspect of part of the southern sector of the AoS showing agricultural areas and derelict agricultural land. A reed bed marking the course of Wied Ta'Kerrex is visible on the right hand side

Figure 23: long-derelict agricultural land undergoing secondary succession at Ta' L-Ibraġ

Figure 24: General view of the solution subsidence structure at il-Qawra showing Inland Sea and Pleistocene colluvium at centre of photograph.

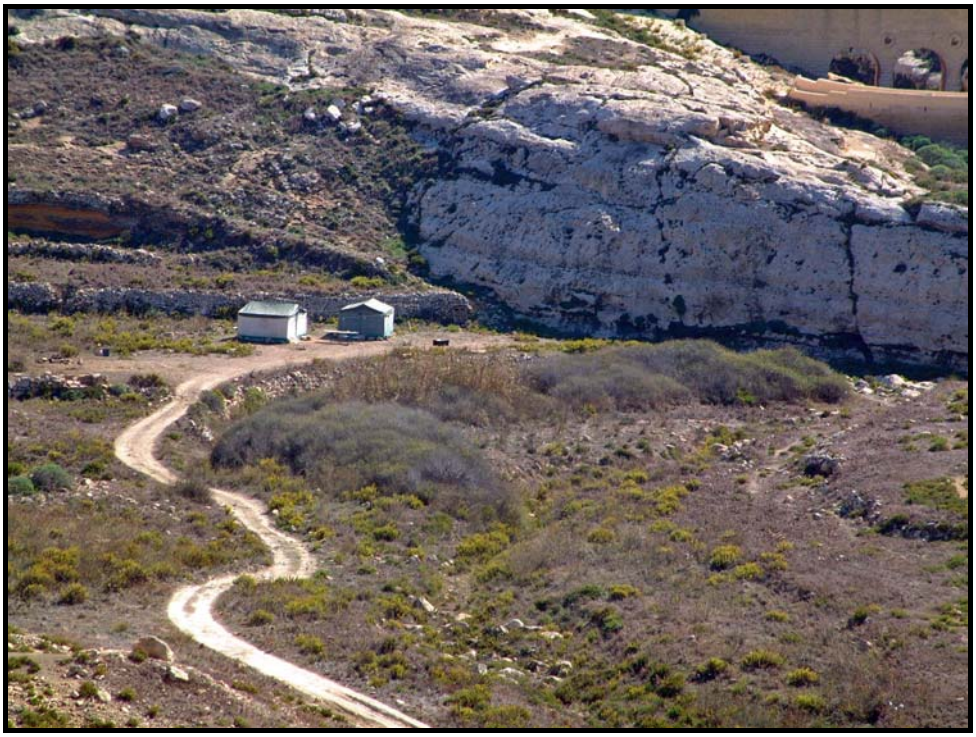

Figure 25: General view of transitional coastal wetland at il-Qawra.

Figure 26: Steppe dominated by Golden Samphire (*Inula crithmoides*) and Wild Artichoke (*Cynara cardunculus*) at il-Qawra

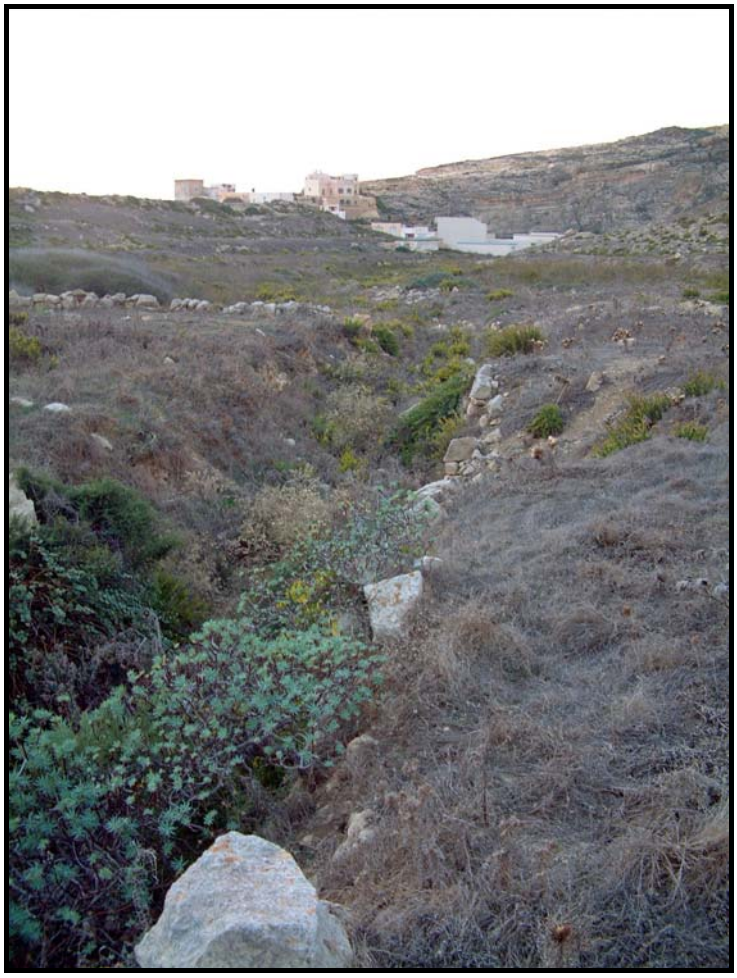

Figure 27: incised channel at il-Qawra comprising Tree Spurge (*Euphorbia dendroides*) and Golden Samphire (*Inula crithmoides*)

Figure 28: Chaste Tree (*Vitex agnus-castus*) from the transitional coastal wetland at il-Qawra

Figure 29: General aspect of the environs of the freshwater pool at il-Qattara.

Figure 30: Mounds of construction debris at Ta'Slima colonised by Maltese Salt-Tree (*Darniella melitensis*).

Figure 31: Freshwater pool at Ta'Sarraflu

Figure 32: Tree Spurge formation at Wied Sufar

Figure 33: Reed bed indicating course of Wied Ta'Kerrex

Figure 34: Dry stone walls colonised by Maltese Salt Tree (*Darniella melitensis*)

9 APPENDICES

Appendix A: Species recorded from rupestral communities.

Family	Species	Vernacular	RDB status
Apiaceae	*Crithmum maritimum*	Sea-Fennel	Not listed
Apiaceae	*Daucus rupestris*	Cliff Carrot	Rest (MED+MI)
Asteraceae	*Helichrysum melitense*	Maltese Everlasting	Endemic, RR, Rest (MI)
Asteraceae	*Inula crithmoides*	Golden Samphire	Not listed
Brassicaceae	*Capparis orientalis*	Caper	Not listed
Brassicaceae	*Matthiola incana* ssp. *melitensis*	Maltese Stocks	Endemic, R
Chenopodiaceae	*Cremnophyton lanfrancoi*	Maltese Cliff Orache	Endemic, R, Rest (MI)
Chenopodiaceae	*Darniella melitensis*	Maltese Salt-Tree	Endemic
Clusiaceae	*Hypericum aegyptiacum*	Egyptian St. John's Wort	Rest (MED)
Euphorbiaceae	*Euphorbia dendroides*	Tree Spurge	Not listed

Appendix B: Species recorded from maritime steppe/garrigue

From Fuq it-Tieqa to Ta'Slima:

Family	Species	Vernacular	RDB status
Aizoaceae	*Carpobrotus edulis*	Hottentot Fig	Not listed
Amaryllidaceae	*Narcissus serotinus*	Autumn Narcissus	Not listed
Apiaceae	*Crithmum maritimum*	Sea-Fennel	Not listed
Apiaceae	*Daucus rupestris*	Cliff Carrot	Rest (MED+MI)
Asteraceae	*Anthemis urvilleana*	Maltese Sea-Chamomile	Endemic
Asteraceae	*Carlina involucrata*	Carline Thistle	Rest (MED)
Asteraceae	*Chiliadenus bocconei*	Maltese Fleabane	Endemic
Asteraceae	*Dittrichia viscosa*	Sticky Fleabane	Not listed
Asteraceae	*Glebionis coronaria*	Crown Daisy	Not Listed
Asteraceae	*Helichrysum melitense*	Maltese Everlasting	Endemic, RR, Rest (MI)
Asteraceae	*Hyoseris frutescens*	Maltese Hyoseris	Endemic
Asteraceae	*Inula crithmoides*	Golden Samphire	Not Listed
Asteraceae	*Phagnalon graecum*	Eastern Phagnalon	Rest (MED)
Asteraceae	*Senecio leucanthemifolius*	Cliff Groundsel	R, Rest (MED+MI)
Asteraceae	*Sonchus oleraceus*	Smooth Sow Thistle	Not Listed
Boraginaceae	*Echium arenarium*	Sand Bugloss	Not Listed
Brassicaceae	*Capparis orientalis*	Caper	Not listed
Brassicaceae	*Lobularia maritima*	Sweet Alyssum	Not listed
Brassicaceae	*Matthiola incana* ssp. *melitensis*	Maltese Stocks	Endemic, R
Caryophyllaceae	*Rhodalsine geniculata*	Woody Sandwort	Not listed
Chenopodiaceae	*Cremnophyton lanfrancoi*	Maltese Cliff Orache	Endemic, R, Rest (MI)
Chenopodiaceae	*Darniella melitensis*	Maltese Salt-Tree	Endemic
Clusiaceae	*Hypericum aegyptiacum*	Egyptian St. John's Wort	Rest (MED)
Euphorbiaceae	*Euphorbia pinea*	Pine Spurge	Not listed
Fabaceae	*Hedysarum glomeratum*	Clustered Clover	Not Listed
Fabaceae	*Hippocrepis* sp.	Horseshoe Vetch	Not Listed
Fabaceae	*Lotus cytisoides*	Grey Birdsfoot Trefoil	Not Listed
Fabaceae	*Lotus edulis*	Edible Birdsfoot Trefoil	Not Listed
Fabaceae	*Lotus ornithopodiodes*	Common Birdsfoot Trefoil	Not Listed
Fabaceae	*Psoralea bituminosa*	Pitch Clover	Not listed
Frankeniaceae	*Frankenia hirsuta*	Hairy Sea-Heath	Not listed
Hyacinthaceae	*Urginea pancration*	Seaside Squill	Rest (MED)
Iridaceae	*Romulea ramiflora*	Sand Crocus	Not Listed
Lamiaceae	*Thymbra capitata*	Mediterranean Thyme	GN 85 (1932)

Malvaceae	*Lavatera arborea*	Tree Mallow	Not listed
Plantaginaceae	*Plantago coronopus* s.l.	Buck's Horn Plantain	Not Listed
Plumbaginaceae	*Limonium melitensis*	Maltese Sea-Lavender	Endemic
Rubiaceae	*Crucianella rupestris*	Rock Crosswort	Rest (MED)

Vicinity of Iċ-Ċnus:

Family	**Species**	**Vernacular**	**RDB status**
Amaryllidaceae	*Narcissus serotinus*	Autumn Narcissus	Not listed
Apiaceae	*Crithmum maritimum*	Sea-Fennel	Not listed
Apiaceae	*Daucus rupestris*	Cliff Carrot	Rest (MED+MI)
Asparagaceae	*Asparagus aphyllus*	Spiny Asparagus	Not listed
Asteraceae	*Calendula suffruticosa* ssp. *fulgida*	Shrubby Marigold	I, Rest (MED)
Asteraceae	*Carlina involucrata*	Carline Thistle	Rest (MED)
Asteraceae	*Dittrichia viscosa*	Sticky Fleabane	Not listed
Asteraceae	*Helichrysum melitense*	Maltese Everlasting	Endemic, RR, Rest (MI)
Asteraceae	*Inula crithmoides*	Golden Samphire	Not Listed
Asteraceae	*Phagnalon graecum*	Eastern Phagnalon	Rest (MED)
Asteraceae	*Sonchus oleraceus*	Smooth Sow Thistle	Not Listed
Brassicaceae	*Capparis orientalis*	Caper	Not listed
Brassicaceae	*Lobularia maritima*	Sweet Alyssum	Not listed
Brassicaceae	*Matthiola incana* ssp. *melitensis*	Maltese Stocks	Endemic, R
Chenopodiaceae	*Darniella melitensis*	Maltese Salt-Tree	Endemic
Convolvulaceae	*Convolvulus oleifolius*	Olive-Leaved Bindweed	Rest (MED)
Euphorbiaceae	*Euphorbia pinea*	Pine Spurge	Not listed
Fabaceae	*Lotus cytisoides*	Grey Birdsfoot Trefoil	Not Listed
Fabaceae	*Lotus edulis*	Edible Birdsfoot Trefoil	Not Listed
Fabaceae	*Lotus ornithopodiodes*	Common Birdsfoot Trefoil	Not Listed
Fabaceae	*Ononis natrix* ssp. *ramosissima*	Bushy Restharrow	Not listed
Fabaceae	*Psoralea bituminosa*	Pitch Clover	Not listed
Hyacinthaceae	*Urginea pancration*	Seaside Squill	Rest (MED)
Lamiaceae	*Thymbra capitata*	Mediterranean Thyme	GN 85 (1932)
Liliaceae	*Colchicum cupanii*	Mediterranean Meadow Saffron	Not listed
Malvaceae	*Lavatera arborea*	Tree Mallow	Not listed
Plantaginaceae	*Plantago coronopus* s.l.	Buck's Horn Plantain	Not Listed
Plumbaginaceae	*Limonium melitensis*	Maltese Sea-Lavender	Endemic
Rubiaceae	*Crucianella rupestris*	Rock Crosswort	Rest (MED)
Rutaceae	*Ruta chalepensis*	Fringed Rue	Not listed

From it-Turretta to ta'Ħarrux:

Family	Species	Vernacular	RDB status
Alliaceae	*Allium arvense*	White Round-Headed Garlic	RR, Rest(MI)
Amaryllidaceae	*Narcissus serotinus*	Autumn Narcissus	Not listed
Apiaceae	*Crithmum maritimum*	Sea-Fennel	Not listed
Apiaceae	*Daucus carota*	Wild Carrot	Not listed
Apiaceae	*Daucus rupestris*	Cliff Carrot	Rest (MED+MI)
Apiaceae	*Ferula communis*	Giant Fennel	Not listed
Asparagaceae	*Asparagus aphyllus*	Spiny Asparagus	Not listed
Asteraceae	*Calendula suffruticosa* ssp. *fulgida*	Shrubby Marigold	I, Rest (MED)
Asteraceae	*Carlina involucrata*	Carline Thistle	Rest (MED)
Asteraceae	*Dittrichia viscosa*	Sticky Fleabane	Not listed
Asteraceae	*Galactites tomentosa*	Boar Thistle	Not listed
Asteraceae	*Helichrysum melitense*	Maltese Everlasting	Endemic, RR, Rest (MI)
Asteraceae	*Inula crithmoides*	Golden Samphire	Not Listed
Asteraceae	*Phagnalon graecum*	Eastern Phagnalon	Rest (MED)
Asteraceae	*Sonchus oleraceus*	Smooth Sow Thistle	Not Listed
Brassicaceae	*Capparis orientalis*	Caper	Not listed
Brassicaceae	*Lobularia maritima*	Sweet Alyssum	Not listed
Brassicaceae	*Matthiola incana* ssp. *melitensis*	Maltese Stocks	Endemic, R
Chenopodiaceae	*Darniella melitensis*	Maltese Salt-Tree	Endemic
Euphorbiaceae	*Euphorbia pinea*	Pine Spurge	Not listed
Fabaceae	*Lotus cytisoides*	Grey Birdsfoot Trefoil	Not Listed
Fabaceae	*Lotus edulis*	Edible Birdsfoot Trefoil	Not Listed
Fabaceae	*Lotus ornithopodiodes*	Common Birdsfoot Trefoil	Not Listed
Fabaceae	*Psoralea bituminosa*	Pitch Clover	Not listed
Hyacinthaceae	*Urginea pancration*	Seaside Squill	Rest (MED)
Lamiaceae	*Thymbra capitata*	Mediterranean Thyme	GN 85 (1932)
Malvaceae	*Lavatera arborea*	Tree Mallow	Not listed
Plantaginaceae	*Plantago coronopus* s.l.	Buck's Horn Plantain	Not Listed
Plumbaginaceae	*Limonium melitensis*	Maltese Sea-Lavender	Endemic
Poaceae	*Avena barbata*	Wild Oat	Not listed
Poaceae	*Avena sterilis*	Wild Oat	Not listed
Poaceae	*Stipa capensis*	Common Awn-Grass	Not listed
Poaceae	*Trachynia distachya*	Trachynia Grass	Not listed
Resedaceae	*Reseda alba*	White Mignonette	Not listed
Rubiaceae	*Crucianella rupestris*	Rock Crosswort	Rest (MED)

Appendix C: Species recorded from valley sides

Family	Species	Vernacular	RDB status
Apiaceae	*Daucus carota*	Wild Carrot	Not listed
Asparagaceae	*Asparagus aphyllus*	Spiny Asparagus	Not listed
Asteraceae	*Calendula suffruticosa* ssp. *fulgida*	Shrubby Marigold	I, Rest (MED)
Asteraceae	*Carlina involucrata*	Carline Thistle	Rest (MED)
Asteraceae	*Chiliadenus bocconei*	Maltese Fleabane	Endemic
Asteraceae	*Galactites tomentosa*	Boar Thistle	Not listed
Asteraceae	*Hyoseris frutescens*	Maltese Hyoseris	Endemic
Asteraceae	*Inula crithmoides*	Golden Samphire	Not listed
Asteraceae	*Phagnalon graecum*	Eastern Phagnalon	Rest (MED)
Asteraceae	*Reichardia picroides*	Common Reichardia	Not listed
Asteraceae	*Sonchus oleraceus*	Smooth Sow Thistle	Not listed
Asteraceae	*Urospermum picroides*	Prickly Urospermum	Not listed
Brassicaceae	*Capparis orientalis*	Caper	Not listed
Brassicaceae	*Lobularia maritima*	Sweet Alyssum	Not listed
Cactaceae	*Opuntia ficus-indica*	Prickly Pear	Not listed
Caesalpinaceae	*Ceratonia siliqua*	Carob	Not listed
Chenopodiaceae	*Atriplex halimus*	Shrubby Orache	Not listed
Chenopodiaceae	*Darniella melitensis*	Maltese Salt-Tree	Endemic
Clusiaceae	*Hypericum aegyptiacum*	Egyptian St. John's Wort	Rest (MED)
Crassulaceae	*Sedum caeruleum*	Blue Stonecrop	Rest (MED)
Ericaceae	*Erica multiflora*	Mediterranean Heath	Not listed
Euphorbiaceae	*Euphorbia dendroides*	Tree Spurge	Not listed
Fabaceae	*Anthyllis vulneraria* ssp. *maura*	Common Kidney-Vetch	Not listed
Fabaceae	*Hippocrepis multisiliquosa*	Common Horseshoe Vetch	Not listed
Fabaceae	*Lotus cytisoides*	Grey Birdsfoot Trefoil	Not listed
Fabaceae	*Melitlotus sulcatus*	Mediterranean Melilot	Not listed
Fabaceae	*Psoralea bituminosa*	Pitch Clover	Not listed
Hyacinthaceae	*Urginea pancration*	Seaside Squill	Rest (MED)
Lamiaceae	*Prasium majus*	White Hedge-Nettle	Not listed
Lamiaceae	*Teucrium fruticans*	Olive-Leaved Germander	Not listed
Lamiaceae	*Thymbra capitata*	Mediterranean Thyme	GN 85 (1932)
Moraceae	*Ficus carica*	Fig	Not listed
Myrtaceae	*Eucalyptus* sp.	Eucalyptus	Not listed
Poaceae	*Arundo donax*	Great Reed	Not listed
Poaceae	*Avena barbata*	Wild Oat	Not listed
Poaceae	*Catapodium marinum*	Sea Fern-Grass	Not listed
Poaceae	*Hyparrhenia hirta*	Hispid Beard-Grass	Not listed
Poaceae	*Lagurus ovatus*	Hare's Tail Grass	Not listed
Rhamnaceae	*Rhamnus oleoides*	Olive-Leaved Buckthorn	Not listed
Rubiaceae	*Crucianella rupestris*	Rock Crosswort	Rest (MED)
Rutaceae	*Ruta chalepensis*	Fringed Rue	Not listed
Smilacaceae	*Smilax aspera*	Common Smilax	Not listed

Appendix D: Species recorded from grass communities on valley sides

Family	Species	Vernacular	RDB status
Apiaceae	*Daucus carota*	Wild Carrot	Not listed
Apiaceae	*Ferula communis*	Giant Fennel	Not listed
Apiaceae	*Foeniculum vulgare*	Fennel	Not listed
Asteracaeae	*Galactites tomentosa*	Boar Thistle	Not listed
Asteraceae	*Glebionis coronarium*	Crown Daisy	Not listed
Asteraceae	*Dittrichia viscosa*	Sticky Fleabane	Not listed
Asteraceae	*Carlina involucrata*	Carline Thistle	Rest (MED)
Asteraceae	*Reichardia picroides*	Common Reichardia	Not listed
Asteraceae	*Sonchus oleraceus*	Smooth Sow Thistle	Not listed
Boraginaceae	*Borago officinalis*	Borage	Not listed
Brassicaceae	*Diplotaxis erucoides*	White Mustard	Not listed
Fabaceae	*Medicago polymorpha*	Toothed Medick	Not listed
Fabaceae	*Ononis natrix* ssp. *ramosissima*	Bushy Restharrow	Not listed
Geraniaceae	*Erodium malacoides*	Glandular Storksbill	Not listed
Geraniaceae	*Geranium molle*	Dovesfoot Cranesbill	Not listed
Hyacinthaceae	*Urginea pancration*	Seaside Squill	Rest (MED)
Lamiaceae	*Mentha pulegium*	Pennyroyal	Not listed
Malvaceae	*Lavatera cretica*	Cretan Mallow	Not listed
Malvaceae	*Malva sylvestris*	Mallow	Not listed
Malvaceae	*Lavatera arborea*	Tree Mallow	Not listed
Plantaginaceae	*Plantago coronopus* s.l.	Buck's Horn Plantain	Not listed
Poaceae	*Avena barbata*	Wild Oat	Not listed
Poaceae	*Avena sterilis*	Wild Oat	Not listed
Poaceae	*Stipa capensis*	Common Awn-Grass	Not listed

Appendix E: species recorded from valley beds

Family	Species	Vernacular	RDB status
Apiaceae	*Crithmum maritimum*	Sea-Fennel	Not listed
Apiaceae	*Daucus carota*	Wild Carrot	Not listed
Apiaceae	*Daucus lopadusanus*	Lampedusa Carrot	I, Rest (MED)
Apiaceae	*Ferula communis*	Giant Fennel	Not listed
Apiaceae	*Foeniculum vulgare*	Fennel	Not listed
Araceae	*Arisarum vulgare*	Friar's Cowl	Not listed
Araceae	*Arum italicum*	Italian Lords and Ladies	Not listed
Asparagaceae	*Asparagus aphyllus*	Spiny Asparagus	Not listed
Asteraceae	*Aster squamatus*	Narrow-Leaved Aster	Not listed
Asteraceae	*Dittrichia viscosa*	Sticky Fleabane	Not listed
Asteraceae	*Galactites tomentosa*	Boar Thistle	Not listed
Asteraceae	*Glebionis coronarium*	Crown Daisy	Not listed
Asteraceae	*Inula crithmoides*	Golden Samphire	Not listed
Asteraceae	*Reichardia picroides*	Common Reichardia	Not listed
Asteraceae	*Sonchus oleraceus*	Smooth Sow Thistle	Not listed
Asteraceae	*Urospermum picroides*	Prickly Urospermum	Not listed
Boraginaceae	*Borago officinalis*	Borage	Not listed
Brassicaceae	*Brassica rapa*	Bargeman's Cabbage	Not listed
Brassicaceae	*Capparis orientalis*	Caper	Not listed
Brassicaceae	*Lobularia maritima*	Sweet Alyssum	Not listed
Brassicaceae	*Raphanus raphanistrum*	Wild Radish	Not listed
Caesalpinaceae	*Ceratonia siliqua*	Carob	Not listed
Caryophyllaceae	*Silene colorata*	Red Campion	Not listed
Crassulaceae	*Sedum caeruleum*	Blue Stonecrop	Rest (MED)
Euphorbiaceae	*Euphorbia pinea*	Pine Spurge	Not listed
Euphorbiaceae	*Mercurialis annua*	Annual Mercury	Not listed
Fabaceae	*Lathyrus clymenum*	Crimson Pea	Not listed
Fabaceae	*Medicago polymorpha*	Toothed Medick	Not listed
Fabaceae	*Ononis mitissima*	Mediterranean Restharrow	Not listed
Fabaceae	*Ononis natrix* ssp. *ramosissima*	Bushy Restharrow	Not listed
Fabaceae	*Psoralea bituminosa*	Pitch Clover	Not listed
Fabaceae	*Trifolium nigrescens*	Lesser White Clover	Not listed
Fabaceae	*Trifolium resupinatum*	Reversed Clover	Not listed
Geraniaceae	*Erodium malacoides*	Glandular Storksbill	Not listed
Geraniaceae	*Geranium molle*	Dovesfoot Cranesbill	
Hyacinthaceae	*Urginea pancration*	Seaside Squill	Rest (MED)
Iridaceae	*Gladiolus italicus*	Field Gladiolus	Not listed
Lamiaceae	*Mentha pulegium*	Pennyroyal	Not listed
Malvaceae	*Lavatera arborea*	Tree Mallow	Not listed
Malvaceae	*Lavatera cretica*	Cretan Mallow	Not listed
Mimosaceae	*Acacia cyanophylla*	Blue-Leaved Acacia	Not listed
Moraceae	*Ficus carica*	Fig	Not listed
Myrtaceae	*Eucalyptus* sp.	Eucalyptus	Not listed
Oleaceae	*Olea europaea* s.l.	Olive	Rest(MI) ?

Oxalidaceae	*Oxalis pes-caprae*	Cape Sorrel	Not listed
Papaveraceae	*Papaver rhoeas*	Poppy	Not listed
Poaceae	*Arundo donax*	Great Reed	Not listed
Poaceae	*Avena* spp.	Wild Oat	Not listed
Poaceae	*Lagurus ovatus*	Hare's Tail Grass	Not listed
Poaceae	*Stipa capensis*	Common Awn-Grass	Not listed
Polygonaceae	*Rumex conglomeratus*	Clustered Dock	Not listed
Punicaceae	*Punica granatum*	Pomegranate	Not listed
Rosaceae	*Prunus* spp.	Almond, Peach Apricot	Not listed
Tamaricaceae	*Tamarix africana*	Tamarisk	R, Rest (MED+MI)
Urticaceae	*Parietaria judaica*	Pellitory-of-the-wall	Not listed

Appendix F: species recorded from aerohaline shore community

Family	Species	Vernacular	RDB status
Apiaceae	*Crithmum maritimum*	Sea-Fennel	Not listed
Apiaceae	*Daucus rupestris*	Cliff Carrot	Rest (MED+MI)
Asteraceae	*Anthemis urvilleana*	Maltese Sea-Chamomile	Endemic
Asteraceae	*Helichrysum melitense*	Maltese Everlasting	Endemic, RR, Rest (MI)
Asteraceae	*Inula crithmoides*	Golden Samphire	Not listed
Brassicaceae	*Capparis orientalis*	Caper	Not listed
Chenopodiaceae	*Arthrocnemum macrostachyum*	Shrubby Glasswort	Not listed
Chenopodiaceae	*Atriplex halimus*	Shrubby Orache	Not listed
Plumbaginaceae	*Limonium melitensis*	Maltese Sea-Lavender	Endemic

Appendix G: Species recorded from steppe community at il-Qawra

Family	Species	Vernacular	RDB status
Aizoaceae	*Mesembryanthemum nodiflorum*	Lesser Crystal-Plant	Not listed
Amaryllidaceae	*Narcissus serotinus*	Autumn Narcissus	Not listed
Apiaceae	*Daucus carota*	Wild Carrot	Not listed
Apiaceae	*Crithmum maritimum*	Sea-Fennel	Not listed
Apiaceae	*Foeniculum vulgare*	Fennel	Not listed
Asparagaceae	*Asparagus aphyllus*	Spiny Asparagus	Not listed
Asteraceae	*Anthemis urvilleana*	Maltese Sea-Chamomile	Endemic
Asteraceae	*Aster squamatus*	Narrow-Leaved Aster	Not listed
Asteraceae	*Calendula arvensis*	Field Marigold	Not listed
Asteraceae	*Carlina involucrata*	Carline Thistle	Rest (MED)
Asteraceae	*Centauraea nicaensis*	Southern Star Thistle	Not listed
Asteraceae	*Cichorium intybus*	Chicory	Not listed
Asteraceae	*Cynara cardunculus*	Wild Artichoke	Not listed
Asteraceae	*Dittrichia viscosa*	Sticky Fleabane	Not listed
Asteraceae	*Galactities tomentosa*	Boar Thistle	Not listed
Asteraceae	*Hedypnois rhagadioloides*	Variable Hyoseris	Not listed
Asteraceae	*Helichrysum melitense*	Maltese Everlasting	Endemic, RR, Rest (MI)
Asteraceae	*Inula crithmoides*	Golden Samphire	Not listed
Asteraceae	*Scolymus hispanicus*		Not listed
Asteraceae	*Urospermum picroides*	Prickly Urospermum	Not listed
Asteraceae	*Aster squamatus*	Narrow-Leaved Aster	Not listed
Asteraceae	*Sonchus oleraceus*	Smooth Sow Thistle	Not listed
Asteraceae	*Reichardia picroides*	Common Reichardia	Not listed
Boraginaceae	*Borago officinalis*	Borage	Not listed
Brassicaceae	*Capparis orientalis*	Caper	Not listed
Brassicaceae	*Lobularia maritima*	Sweet Alyssum	Not listed
Chenopodiaceae	*Atriplex halimus*	Shrubby Orache	Not listed
Convolvulaceae	*Convolvulus arvensis*	Field Bindweed	Not listed
Euphorbiaceae	*Euphorbia pinea*	Pine Spurge	Not listed
Fabaceae	*Hedysarum coronarium*	Sulla	Not listed
Fabaceae	*Lathyrus clymenum*	Crimson Pea	Not listed
Fabaceae	*Lotus edulis*	Edible Birdsfoot Trefoil	Not listed
Fabaceae	*Lotus ornithopodiodes*	Common Birdsfoot Trefoil	Not listed
Fabaceae	*Lotus tetragonolobus*	Winged Pea	Not listed
Fabaceae	*Melitlotus sulcatus*	Mediterranean Melilot	Not listed
Fabaceae	*Psoralea bituminosa*	Pitch Clover	Not listed
Fabaceae	*Trifolium resupinatum*		Not listed
Frankeniaceae	*Frankenia pulverulenta*	Annual Sea-Heath	Not listed

Geraniaceae	*Erodium malcoides*	Glandular Storksbill	Not listed
Geraniaceae	*Geranium molle*	Dovesfoot Cranesbill	Not listed
Geraniaceae	*Geranium rotundiflorum*	Round-leaved Cranesbill	Not listed
Hyacinthaceae	*Urginea pancration*	Seaside Squill	Rest (MED)
Oxalidaceae	*Oxalis pes-caprae*	Cape Sorrel	Not listed
Plantaginaceae	*Plantago coronopus* s.l.	Buck's Horn Plantain	Not listed
Plantaginaceae	*Plantago lagopus*	Hare's-foot Plantain	Not listed
Poaceae	*Avena* spp.	Wild Oat	Not listed
Poaceae	*Dactylis hispanica*	Cock's-Foot	Not listed
Poaceae	*Festuca arundinacea*	Fescue	Not listed
Poaceae	*Hordeum leporinum*	Wild Barley	Not listed
Poaceae	*Lagurus ovatus*	Hare's Tail Grass	Not listed
Poaceae	*Lolium rigidum*	Stiff Rye-Grass	Not listed
Poaceae	*Parapholis incurva*	Curved Hard-Grass	Not listed
Poaceae	*Phalaris caerulescens*	Purple Canary Grass	Not listed
Poaceae	*Rostraria cristata*		Not listed
Poaceae	*Stipa capensis*	Common Awn-Grass	Not listed
Poaceae	*Trachynia distachya*	Trachynia Grass	Not listed
Poaceae	*Bromus diandrus*	Great Brome	Not listed
Poaceae	*Piptatherum miliaceum*	Rice-Grass	Not listed
Poaceae	*Lamarckia aurea*	Golden Grass	Not listed
Poaceae	*Hyparrhenia hirta*	Hispid Beard-Grass	Not listed
Primulaceae	*Anagallis arvensis*	Blue Pimpernel	Not listed
Tamaricaceae	*Tamarix africana*	Tamarisk	R, Rest (MED+MI)

Appendix H: Species recorded from slopes of Pleistocene colluvium

Family	Species	Vernacular	RDB status
Asteraceae	*Cynara cardunculus*	Wild Artichoke	Not listed
Asteraceae	*Dittrichia viscosa*	Sticky Fleabane	Not listed
Asteraceae	*Galactities tomentosa*	Boar Thistle	Not listed
Asteraceae	*Inula crithmoides*	Golden Samphire	Not listed
Brassicaceae	*Capparis orientalis*	Caper	Not listed
Chenopodiaceae	*Darniella melitensis*	Maltese Salt-Tree	Endemic
Euphorbiaceae	*Euphorbia dendroides*	Tree Spurge	Not listed
Tamaricaceae	*Tamarix africana*	Tamarisk	R, Rest (MED+MI)

Appendix I: Species recorded from transitional coastal wetland

Family	Species	Vernacular	RDB status
Araceae	*Arisarum vulgare*	Friar's Cowl	Not listed
Araceae	*Arum italicum*	Italian Lords and Ladies	Not listed
Fabaceae	*Psoralea bituminosa*	Pitch Clover	Not listed
Hyacinthaceae	*Urginea pancration*	Seaside Squill	Rest (MED)
Poaceae	*Arundo donax*	Great Reed	Not listed
Rubiaceae	*Galium aparine*	Common Goosegrass	Not listed
Verbenaceae	*Vitex agnus-castus*	Chaste Tree	R, Rest(MI)

Appendix J: Species recorded from permanent pool at Il-Qattara

Family	Species	Vernacular	RDB status
Adiantaceae	*Adiantum capillus-veneris*	Maidenhair Fern	Not listed
Asteraceae	*Inula crithmoides*	Golden Samphire	Not listed
Asteraceae	*Aster squamatus*	Narrow-Leaved Aster	Not listed
Characeae	*Chara globularis*	Stonewort	Not listed
Lamiaceae	*Mentha pulegium*	Pennyroyal	Not listed
Poaceae	*Trachynia distachya*	Trachynia Grass	Not listed
Polygonaceae	*Rumex bucephalophorus*	Red Dock	Not listed
Primulaceae	*Samolus valerandi*	Brookweed	Not listed
Rosaceae	*Sanguisorba minor* ssp. *muricata*	Salad Burnet	Not listed
Rubiaceae	*Galium aparine*	Common Goosegrass	Not listed
Cyperaceae	*Cyperus longus*	Sweet Galingale	Not listed
Cyperaceae	*Scirpoides holoschoenus*		Not listed
Apiaceae	*Apium graveolens*	Wild Celery	Not listed
Tamaricaceae	*Tamarix africana*	Tamarisk	R, Rest (MED+MI)
Salicaceae	*Salix alba*	White Willow	E, Rest (MI)
Zannichelliaceae	*Zannichellia melitensis*	Horned Pondweed	R, Rest, (MI), Endemic

Appendix K: Species recorded from Wied Ghorof

Family	Species	Vernacular	RDB status
Apiaceae	*Daucus carota*	Wild Carrot	Not listed
Apiaceae	*Daucus rupestris*	Cliff Carrot	Rest (MED+MI)
Apiaceae	*Foeniculum vulgare*	Fennel	Not listed
Asparagaceae	*Asparagus aphyllus*	Spiny Asparagus	Not listed
Asteraceae	*Calendula arvensis*	Field Marigold	Not listed
Asteraceae	*Glebionis coronaria*	Crown Daisy	Not listed
Asteraceae	*Galactites tomentosa*	Boar Thistle	Not listed
Asteraceae	*Inula crithmoides*	Golden Samphire	Not listed
Boraginaceae	*Borago officinalis*	Borage	Not listed
Brassicaceae	*Capparis orientalis*	Caper	Not listed
Brassicaceae	*Lobularia maritima*	Sweet Alyssum	Not listed
Chenopodiaceae	*Atriplex halimus*	Shrubby Orache	Not listed
Clusiaceae	*Hypericum aegyptiacum*	Egyptian St. John's Wort	Rest (MED)
Crassulaceae	*Sedum caeruleum*	Blue Stonecrop	Rest (MED)
Crassulaceae	*Sedum sediforme*	Mediterranean Stonecrop	Not listed
Cyperaceae	*Carex divisa*	Divided Sedge	Not listed
Euphorbiaceae	*Euphorbia dendroides*	Tree Spurge	Not listed
Euphorbiaceae	*Mercurialis annua*	Annual Mercury	Not listed
Fabaceae	*Lathyrus clymenum*	Crimson Pea	Not listed
Fabaceae	*Lotus edulis*	Edible Birdsfoot Trefoil	Not listed
Fabaceae	*Psoralea bituminosa*	Pitch Clover	Not listed
Frankeniaceae	*Frankenia pulverulenta*	Annual Sea-Heath	Not listed
Geraniaceae	*Erodium moschatum*	Musk Storksbill	Not listed
Hyacinthaceae	*Urginea pancration*	Seaside Squill	Rest (MED)
Lamiaceae	*Teucrium fruticans*	Olive-Leaved Germander	Not listed
Lamiaceae	*Thymbra capitata*	Mediterranean Thyme	GN 85 (1932)
Malvaceae	*Malva sylvestris*	Mallow	Not listed
Moraceae	*Ficus carica*	Fig	Not listed
Oxalidaceae	*Oxalis pes-caprae*	Cape Sorrel	Not listed
Papaveraceae	*Papaver rhoeas*	Poppy	Not listed
Poaceae	*Avena* spp.	Wild Oat	Not listed
Poaceae	*Hyparrhenia hirta*	Hispid Beard-Grass	Not listed
Poaceae	*Lolium rigidum*	Stiff Rye-Grass	Not listed
Polygonaceae	*Rumex conglomeratus*	Clustered Dock	Not listed
Scrophulariaceae	*Antirrhinum tortuosum*	Greater Snapdragon	Not listed
Smilacaceae	*Smilax aspera*	Common Smilax	Not listed
Urticaceae	*Parietaria judaica*	Pellitory-of-the-wall	Not listed
Verbenaceae	*Vitex agnus-castus*	Chaste Tree	R, Rest(MI)

Appendix L: Species recorded from Wied Sufar

Family	Species	Vernacular	RDB status
Agavaceae	*Agave americana*	Century Plant	Not listed
Amaryllidaceae	*Narcissus serotinus*	Autumn Narcissus	Not listed
Apiaceae	*Crithmum maritimum*	Sea-Fennel	Not listed
Apiaceae	*Daucus carota*	Wild Carrot	Not listed
Apiaceae	*Foeniculum vulgare*	Fennel	Not listed
Araceae	*Arisarum vulgare*	Friar's Cowl	Not listed
Asparagaceae	*Asparagus aphyllus*	Spiny Asparagus	Not listed
Asteraceae	*Calendula suffruticosa* ssp. *fulgida*	Shrubby Marigold	I, Rest (MED)
Asteraceae	*Dittrichia viscosa*	Sticky Fleabane	Not listed
Asteraceae	*Glebionis coronarium*	Crown Daisy	Not listed
Asteraceae	*Galactites tomentosa*	Boar Thistle	Not listed
Asteraceae	*Hyoseris frutescens*	Maltese Hyoseris	Endemic
Asteraceae	*Inula crithmoides*	Golden Samphire	Not listed
Asteraceae	*Reichardia picroides*	Common Reichardia	Not listed
Brassicaceae	*Brassica rapa*	Bargeman's Cabbage	Not listed
Brassicaceae	*Capparis orientalis*	Caper	Not listed
Brassicaceae	*Diplotaxis erucoides*	White Mustard	Not listed
Brassicaceae	*Diplotaxis tenuifolia*	Yellow Wall-Rocket	Not listed
Brassicaceae	*Lobularia maritima*	Sweet Alyssum	Not listed
Cactaceae	*Opuntia ficus-indica*	Prickly Pear	Not listed
Chenopodiaceae	*Atriplex halimus*	Shrubby Orache	Not listed
Clusiaceae	*Hypericum aegyptiacum*	Egyptian St. John's Wort	Rest (MED)
Convolvulaceae	*Convolvulus arvensis*	Field Bindweed	Not listed
Ericaceae	*Erica multiflora*	Mediterranean Heath	Not listed
Euphorbiaceae	*Euphorbia dendroides*	Tree Spurge	Not listed
Euphorbiaceae	*Euphorbia pinea*	Pine Spurge	Not listed
Euphorbiaceae	*Mercurialis annua*	Annual Mercury	Not listed
Fabaceae	*Lotus cytisoides*	Grey Birdsfoot Trefoil	Not listed
Fabaceae	*Lotus edulis*	Edible Birdsfoot Trefoil	Not listed
Fabaceae	*Ononis natrix* ssp. *ramosissima*	Bushy Restharrow	Not listed
Fabaceae	*Psoralea bituminosa*	Pitch Clover	Not listed
Hyacinthaceae	*Urginea pancration*	Seaside Squill	Rest (MED)
Lamiaceae	*Teucrium fruticans*	Olive-Leaved Germander	Not listed
Lamiaceae	*Thymbra capitata*	Mediterranean Thyme	GN 85 (1932)
Moraceae	*Ficus carica*	Fig	Not listed
Myrtaceae	*Eucalyptus* sp.	Eucalyptus	Not listed
Oxalidaceae	*Oxalis pes-caprae*	Cape Sorrel	Not listed
Papaveraceae	*Papaver rhoeas*	Poppy	Not listed
Poaceae	*Arundo donax*	Great Reed	Not listed
Poaceae	*Avena* spp.	Wild Oat	Not listed
Poaceae	*Hyparrhenia hirta*	Hispid Beard-Grass	Not listed
Rhamnaceae	*Rhamnus oleoides*	Olive-Leaved	Not listed

		Buckthorn	
Rubiaceae	*Crucianella rupestris*	Rock Crosswort	Rest (MED)
Rutaceae	*Ruta chalepensis*	Fringed Rue	Not listed
Scrophulariaceae	*Antirrhinum tortuosum*	Greater Snapdragon	Not listed
Verbenaceae	*Vitex agnus-castus*	Chaste Tree	R, Rest(MI)

Appendix M: Species recorded from permanent pool at Ta' Sarraflu

Family	Species	Vernacular	RDB status
Apiaceae	*Foeniculum vulgare*	Fennel	Not listed
Apocyanaceae	*Nerium oleander*	Oleander	Not listed
Asparagaceae	*Asparagus aphyllus*	Spiny Asparagus	Not listed
Asteraceae	*Inula crithmoides*	Golden Samphire	Not listed
Brassicaceae	*Diplotaxis tenuifolia*	Yellow Wall-Rocket	Not listed
Tamaricaceae	*Tamarix africana*	Tamarisk	R, Rest (MED+MI)

Appendix N: Species recorded from mounds of construction debris

Family	Species	Vernacular	RDB status
Apiaceae	*Daucus carota*	Wild Carrot	Not listed
Apiaceae	*Ferula communis*	Giant Fennel	Not listed
Apiaceae	*Foeniculum vulgare*	Fennel	Not listed
Asparagaceae	*Asparagus aphyllus*	Spiny Asparagus	Not listed
Asteraceae	*Aster squamatus*	Narrow-Leaved Aster	Not listed
Asteraceae	*Galactites tomentosa*	Boar Thistle	Not listed
Asteraceae	*Glebionis coronaria*	Crown Daisy	Not listed
Asteraceae	*Inula crithmoides*	Golden Samphire	Not listed
Asteraceae	*Matricaria recucita*	Chamomile	Not listed
Asteraceae	*Senecio bicolor*	Silvery Ragwort	Not listed
Boraginaceae	*Borago officinalis*	Borage	Not listed
Brassicaceae	*Brassica rapa*	Bargeman's Cabbage	Not listed
Brassicaceae	*Capparis orientalis*	Caper	Not listed
Brassicaceae	*Diplotaxis erucoides*	White Mustard	Not listed
Brassicaceae	*Diplotaxis tenuifolia*	Yellow Wall-Rocket	Not listed
Brassicaceae	*Matthiola incana* ssp. *melitensis*	Maltese Stocks	Rare, endemic
Cactaceae	*Opuntia ficus-indica*	Prickly Pear	Not listed
Chenopodiaceae	*Atriplex halimus*	Shrubby Orache	Not listed
Chenopodiaceae	*Chenopodium album*	Fat Hen	Not listed
Chenopodiaceae	*Darniella melitensis*	Maltese Salt-Tree	Endemic
Euphorbiaceae	*Mercurialis annua*	Annual Mercury	Not listed
Fabaceae	*Hedysarum coronarium*	Sulla	Not listed
Fabaceae	*Lotus edulis*	Edible Birdsfoot Trefoil	Not listed
Fabaceae	*Trifolium resupinatum*	Reversed Clover	Not listed
Geraniaceae	*Erodium malacoides*	Glandular Storksbill	Not listed
Malvaceae	*Lavatera arborea*	Tree Mallow	Not listed
Malvaceae	*Lavatera cretica*	Cretan Mallow	Not listed
Malvaceae	*Malva sylvestris*	Mallow	Not listed
Orobanchaceae	*Orobanche pubescens*	Hairy Broomrape	Not listed
Oxalidaceae	*Oxalis pes-caprae*	Cape Sorrel	Not listed
Papaveraceae	*Papaver rhoeas*	Poppy	Not listed
Plantaginaceae	*Plantago coronopus* s.l.	Buck's Horn Plantain	Not listed
Poaceae	*Arundo donax*	Great Reed	Not listed
Poaceae	*Avena* spp.	Wild Oat	Not listed
Poaceae	*Dactylis hispanica*	Cock's-Foot	Not listed
Polygonaceae	*Rumex conglomeratus*	Clustered Dock	Not listed
Primulaceae	*Anagallis arvensis*	Blue Pimpernel	Not listed
Resedaceae	*Reseda alba*	White Mignonette	Not listed
Solanaceae	*Nicotiana glauca*	Shrub Tobacco	Not listed

Appendix O: species recorded from derelict agricultural areas

Family	Species	Vernacular	RDB status
Agavaceae	*Agave americana*	Century Plant	Not listed
Apiaceae	*Crithmum maritimum*	Sea-Fennel	Not listed
Apiaceae	*Daucus carota*	Wild Carrot	Not listed
Apiaceae	*Foeniculum vulgare*	Fennel	Not listed
Araceae	*Arum italicum*	Italian Lords and Ladies	Not listed
Asparagaceae	*Asparagus aphyllus*	Spiny Asparagus	Not listed
Asteraceae	*Carlina involucrata*	Carline Thistle	Rest (MED)
Asteraceae	*Dittrichia viscosa*	Sticky Fleabane	Not listed
Asteraceae	*Galactites tomentosa*	Boar Thistle	Not listed
Asteraceae	*Glebionis coronarium*	Crown Daisy	Not listed
Asteraceae	*Hyoseris radiata*	Perennial Hyoseris	Not listed
Asteraceae	*Inula crithmoides*	Golden Samphire	Not listed
Asteraceae	*Reichardia picroides*	Common Reichardia	Not listed
Asteraceae	*Sonchus oleraceus*	Smooth Sow Thistle	Not listed
Boraginaceae	*Heliotropium europaeum*	Common Heliotrope	Not listed
Brassicaceae	*Brassica rapa*	Bargeman's Cabbage	Not listed
Brassicaceae	*Capparis orientalis*	Caper	Not listed
Brassicaceae	*Diplotaxis erucoides*	White Mustard	Not listed
Brassicaceae	*Diplotaxis tenuifolia*	Yellow Wall-Rocket	Not listed
Brassicaceae	*Lobularia maritima*	Sweet Alyssum	Not listed
Brassicaceae	*Matthiola incana* ssp. *melitensis*	Maltese Stocks	Rare, endemic
Cactaceae	*Opuntia ficus-indica*	Prickly Pear	Not listed
Caryophyllaceae	*Silene colorata*	Red Campion	Not listed
Euphorbiaceae	*Euphorbia dendroides*	Tree Spurge	Not listed
Euphorbiaceae	*Euphorbia pinea*	Pine Spurge	Not listed
Euphorbiaceae	*Mercurialis annua*	Annual Mercury	Not listed
Fabaceae	*Anthyllis vulneraria* ssp. *maura*	Common Kidney-Vetch	Not listed
Fabaceae	*Hedysarum coronarium*	Sulla	Not listed
Fabaceae	*Lathyrus clymenum*	Crimson Pea	Not listed
Fabaceae	*Lotus ornithopodiodes*	Common Birdsfoot Trefoil	Not listed
Fabaceae	*Melitlotus sulcatus*	Mediterranean Melilot	Not listed
Fabaceae	*Ononis natrix* ssp. *ramosissima*	Bushy Restharrow	Not listed
Geraniaceae	*Erodium malacoides*	Glandular Storksbill	Not listed
Hyacinthaceae	*Urginea pancration*	Seaside Squill	Rest (MED)
Lamiaceae	*Teucrium fruticans*	Olive-Leaved Germander	Not listed
Lamiaceae	*Thymbra capitata*	Mediterranenan Thyme	GN 85 (1932)
Malvaceae	*Malva sylvestris*	Mallow	Not listed
Myrtaceae	*Eucalyptus* sp.	Eucalyptus	Not listed
Oxalidaceae	*Oxalis pes-caprae*	Cape Sorrel	Not listed
Poaceae	*Arundo donax*	Great Reed	Not listed
Poaceae	*Avena* spp.	Wild Oat	Not listed

Poaceae	*Hordeum leporinum*	Wild Barley	Not listed
Poaceae	*Lolium rigidum*	Stiff Rye-Grass	Not listed
Poaceae	*Stipa capensis*	Common Awn-Grass	Not listed
Resedaceae	*Reseda alba*	White Mignonette	Not listed
Solanaceae	*Hyoscyamus albus*	White Henbane	Not listed

Appendix P: Species recorded from agricultural verges and borders

Family	Species	Vernacular	RDB status
Apiaceae	*Daucus carota*	Wild Carrot	Not listed
Apiaceae	*Foeniculum vulgare*	Fennel	Not listed
Asparagaceae	*Asparagus aphyllus*	Spiny Asparagus	Not listed
Asteraceae	*Aster squamatus*	Narrow-Leaved Aster	Not listed
Asteraceae	*Carlina involucrata*	Carline Thistle	Rest (MED)
Asteraceae	*Dittrichia viscosa*	Sticky Fleabane	Not listed
Asteraceae	*Inula crithmoides*	Golden Samphire	Not listed
Asteraceae	*Reichardia picroides*	Common Reichardia	Not listed
Asteraceae	*Sonchus oleraceus*	Smooth Sow Thistle	Not listed
Brassicaceae	*Capparis orientalis*	Caper	Not listed
Brassicaceae	*Diplotaxis erucoides*	White Mustard	Not listed
Brassicaceae	*Lobularia maritima*	Sweet Alyssum	Not listed
Chenopodiaceae	*Chenopodium album*	Fat Hen	Not listed
Chenopodiaceae	*Darniella melitensis*	Maltese Salt-Tree	Endemic
Chenopodiaceae	*Salsola soda*	Smooth-Leaved Saltwort	Not listed
Convolvulaceae	*Convolvulus arvensis*	Field Bindweed	Not listed
Euphorbiaceae	*Euphorbia pinea*	Pine Spurge	Not listed
Malvaceae	*Lavatera arborea*	Tree Mallow	Not listed
Malvaceae	*Malva sylvestris*	Mallow	Not listed

Appendix Q: species recorded from Tal-Port

Family	Species	Vernacular	RDB status
Apiaceae	*Daucus rupestris*	Cliff Carrot	Rest (MED+MI)
Apiaceae	*Ferula communis*	Giant Fennel	Not listed
Apiaceae	*Daucus carota*	Wild Carrot	Not listed
Asteraceae	*Helichrysum melitense*	Maltese Everlasting	Endemic, RR, Rest (MI)
Asteraceae	*Inula crithmoides*	Golden Samphire	Not listed
Caryophyllaceae	*Silene vulgaris*	Bladder Campion	Not listed
Chenopodiaceae	*Darniella melitensis*	Maltese Salt-Tree	Endemic
Fabaceae	*Melitlotus sulcatus*	Mediterranean Melilot	Not listed
Fabaceae	*Psoralea bituminosa*	Pitch Clover	Not listed
Frankeniaceae	*Frankenia pulverulenta*	Annual Sea-Heath	Not listed
Geraniaceae	*Geranium rotundiflorum*	Round-leaved Cranesbill	Not listed
Plantaginaceae	*Plantago coronopus* s.l.	Buck's Horn Plantain	Not listed
Plantaginaceae	*Plantago lagopus*	Hare's-foot Plantain	Not listed
Poaceae	*Lagurus ovatus*	Hare's Tail Grass	Not listed
Rubiaceae	*Crucianella rupestris*	Rock Crosswort	Rest (MED)
Rubiaceae	*Valantia muralis*	Wall Valantia	Not listed

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