

SCHEDULE 1

PART 1

Description of Holly Down LLP land

The land comprising that part of the mineral site shown outlined in black and annotated 'HD' on Plan HEM.UU.1 including that within the broken black line and annotated 'FC'

PART 2

Description of the Hemerdon Land LLP land

The land comprising that part of the mineral site shown outlined in black and annotated 'HT' on
Plan HEM.UU.1

PART 3

Description of Newnham Estate Trustees' Land

The land comprising that part of the mineral site shown outlined in black and annotated 'NET' on Plan HEM.UU.1

PART 4

Description of Mr Cobbold's Land

The land comprising that part of the mineral site shown outlined in black and annotated 'DC' on Plan HEM.UU.1

SCHEDULE 2
Planning Permission

Planning permission 9/42/49/0542/85/3

SCHEDULE 3

Restoration Concept

1.0 Introduction

- 1.1 Tungsten was first discovered at Hemerdon in 1867 although mineral working is only thought to have occurred during the periods 1919-1920 and 1934-1944. Further to a long period of no mining activity an application to re-open and extend the mine was jointly made by Amax Exploration of UK Inc and Hemerdon Mining and Smelting Ltd to Devon County Council (DCC), in its function as Mineral Planning Authority (MPA). This was, however, eventually refused further to a public inquiry in 1984.
- 1.2 A revised application for the winning and working of the mineral was made by Amax Exploration UK Inc in 1985 (Application No. 9/42/49/0542/85/3), comprising an opencast pit, mineral processing plant and associated tip, together with the construction of a 'Link Road' between West Park Hill Road and the Lee Mill Road (the B3147) near Newnham Park. This was approved by DCC in 1986, subject to a number of Conditions.
- 1.3 Conditions attached to the consent included phasing, landscaping, restoration, after-use and aftercare provisions requiring submission of details for approval by the Mineral Planning Authority. Condition 10(a) – A scheme for the disposal of waste; and Condition 10(c) – A scheme for the site layout, process plant and ancillary buildings were discharged further to approval given at the DCC Planning Sub-Committee Meeting of 29 May 1991. Condition 10(b)(i)-(iv) – A phased scheme for the progressive landscaping and restoration of the planning permission area was discharged further to the DCC Planning Sub-Committee Meeting of October 1991 with approval given by letter (DCC ref. SDR/MS7.3) dated 28 October 1991. DCC deemed the consent activated further to the company having constructed a screen bund on high ground above the mine and a start made to win, work and process a quantity of the mineral.
- 1.4 The planning permission at Hemerdon remains valid and has fully commenced. No subsequent Review of Old Mineral Permission (ROMP) was carried out by DCC under the provisions of Section 96 and Schedule 13 of the Environment Act 1995. However, in undertaking an informal review of the permission in 2002 DCC concluded that the existing conditions were comprehensive and afforded sufficient protection of the environment. DCC noted that if the operations were to re-open that a review should be

undertaken to consider conditions and the need for an ecological assessment. This position is supported in the Devon County Minerals Local Plan (DCC, 2004) where at Proposal Inset 38.3 it is identified that *The MPA will ensure that a full survey of nature conservation interests and the potential for wildlife habitat creation will be included within any proposed restoration/aftercare measures.*

- 1.5 As part of their commitment prior to re-opening the mineral operations, Wolf Minerals funded research into the ecology of the Planning Permission Area (PPA). The ecological investigation of the PPA was carried out by Michel Hughes Associates (Hughes, 2009) and comprises one of a suite of investigations to inform the process of developing the consented Hemerdon Mine (a résumé of findings from the ecological investigation is provided in Appendix 1 of this report).

2.0 Strategy Approach

- 2.1 The present document considers the phased ecological and landscape restoration of the mine, processing plant and tip areas over the lifetime of the operation of the mine, within the framework of the extant mineral consent.
- 2.2 The strategy outlined seeks to modify the permitted scheme to reflect changes in habitat and landscape priorities since the 1986 consent as well as reflecting constraints brought about by significant deterioration in the quality of the habitat resources available.
- 2.3 The strategy does not review the broad physical form of the permitted scheme of working and restoration, neither does it review the timing of those permitted works or describe a detailed engineered approach¹ to the enhancement of the landscape or habitats.
- 2.4 The aim of the strategy is to comply with both Planning Policy Statement 9: Biodiversity and Geological Conservation, namely there should be *no net loss* of biodiversity and to aim for a *net gain*, and Mineral Planning Guidance 7: Reclamation of Mineral Workings, which has as a key objective *to minimise adverse impacts and to utilise opportunities for positive contributions which a reclaimed site can make to the landscape.*

¹ Even if such an engineered approach were to be prepared it is certain that the outcome would not conform to such detail due largely to the inherent variability and uncertainties involved. Such a scheme would not only indicate spurious certainty but could lead to poor quality outcomes because of the rigid nature of 'approved' works. The potential for changes to, for example, the mass of the waste tip at Crownhill Down, and hence any prospect of modifying the form of that tip, are unclear at this time and are therefore beyond the scope of this document.

3.0 Site Description

- 3.1 The PPA comprises two distinct but contiguous zones. These are here identified as the *Hemerdon Mine area*, 'enclosed' land comprising the site of the disused Hemerdon Mine, together with associated disused mine buildings and other structures as well as often steep agricultural land within the Smallhanger Brook valley and residential properties, and to the north the *Crownhill Down area*, 'open' land which includes most of Crownhill Down together with part of Smallhanger Waste. Hemerdon Mine is centred on NGR SX571586 with a mid-point at Crownhill Down (Wheal Florence) located at NGR SX568595.
- 3.2 The highest part of the mine is located at some 210m and the mine buildings between 170-190m, with the lowest point of the PPA within the Smallhanger Brook valley at approximately 150m. The highest part of Crownhill Down within the PPA is at approximately 210m falling gradually westwards to Lower Hooksburry Wood below Bude Farm at some 60m.
- 3.3 The principal vehicle access to the mine is via a rough track off Ledgate Lane at Goodamoor Plantation with footpath access through the site from the Galva Road near to Drakeland Corner. The sole road on Crownhill Down is the B3417, extending from West Park Hill Road in Plympton to Lee Moor. It only traverses a relatively short western section of the site but carries considerable heavy vehicle traffic associated with the nearby china clay industry. To the west of Crownhill Down are extensive and often steep conifer and broadleaved woodlands within the valley of the Tory Brook forming part of Newnham Park. To the north is the extensive Lee Moor China Clay Works operated by Imerys Minerals Ltd, which includes very large mica dams as well as processing plants within the Torycombe Valley. Abutting Smallhanger Waste on its north-east side is the extensive Headon China Clay Works operated by Sibelco UK Ltd.
- 3.4 Two water courses are identified within the PPA. The Smallhanger Brook flows north-east to south-west through its valley, its source being on Smallhanger Waste, ultimately meeting the Tory Brook to the south of Newnham Park and the River Plym near Marsh Mills in Plymouth. An un-named stream (here referred to as the 'Hooksburry Stream') rises from numerous springs and seepage zones on Crownhill Down to the west of the

B3417, becoming a single watercourse within Lower Hooksbury Wood before meeting the Tory Brook within Newnham Park.

4.0 Consented Development

4.1 The PPA extends to approximately 260ha and will comprise the proposed open pit extending to 36ha, the waste tip and associated water balancing ponds extending to some 175ha, with the remainder comprising the plant site, access and diverted roads and stockpiles extending to some 49ha (the boundaries of each of these is shown in Drawing No. 16349-1 of this report).

4.2 The consented phased development, working and restoration of the site is shown on a series of drawings² which were included with planning application no. 9/42/49/0542/85/3, submitted by Amax Exploration of UK Inc, and which form part of the scheme given consent by DCC on the 5 June 1986. The mine site at intervals of approximately 1, 5, 10, 15 and 20 year after the start of production is shown in drawing nos. H-P-2500-84-043 / 038 / 039 / 046 and 047. The landscape development at intervals of approximately 1, 5, 10 and 15 years as well as the final landscape after the end of operations is shown in drawing nos. H-P-2500-001 / 002 / 003 / 004 and 005.

4.3 The following phased development and restoration proposals are identified from the consented landscape and restoration scheme by reference to drawing nos. H-P-2500-001 to 005 (also originally identified as Figures 4.0 - 4.4):

4.4 Landscape Development – Approx. 1 year after start of Production (Fig. 4.0)

- Clearance of vegetation from mine area, top soil to be stored in dump.
- Clearance of vegetation from plant area, top soil to be stored in dump.
- Construction of plant.
- Construction of access road off B3417 (Lee Moor road), top soil to be stored in dump.
- Construction of haul road (mine-plant-tip), top soil to be stored in dump.
- Construction of retention pond in Smallhanger Brook valley.
- Soils stripped from eastern margin of B3417 to be stored in dump.
- Soils stripped from area of tailings lagoon to be stored in dump.

² The consented working and restoration of the site is only shown on a series of drawings. No supporting text has been identified with the original application.

- Start of working the mine with excavation to 190m AOD. Overburden to form margin of developing tip on the east side of the B3417.
- Completion of visibility bund with tree and shrub planting along highest margin of mine (Hemerdon Ball Plantation to Goodamoor Plantation).
- Retention of remaining fields and hedgerows to the north and east of mine.
- Top soil storage dumps D1, D2, D4 and part D3 allowed to develop to '*moorland/rough grass*'.
- Retention of remaining areas of '*woodland*' and some new woodland planting within the Smallhanger Brook valley.
- Retention of all habitat areas, including fields and hedgerows to the west and north of the B3417.
- Retention of '*grassland*' between top soil storage dump D3 and eastern PPA boundary.
- Planting of narrow band of woodland along part of the southern margin of the Crownhill Down PPA boundary.

4.5 Landscape Development – Approx. 5 year after start of Production (Fig. 4.1)

- Expansion of mine with excavation to 140m AOD.
- Construction of diverted B3417 with verges/embankments allowed to develop to '*moorland/rough grass*'.
- Tip expands to its maximum western extension and reaches 138m. Permanent toe-drain established. Stripped soils stored in dump D3.
- Tailing lagoon '*migrates*' eastwards and is enlarged to adjust to the increasing height of the tip (165m).
- Construction of balancing pond below Bude Farm with retention of part of Lower Hooksburry Wood.
- Further tree and shrub planting along part of bund above mine and part PPA boundary defined by new hedgerow feature.
- New woodland planting along all of the western tip boundary to 138m.
- Establishment of some areas of '*moorland/rough grass*' on the south-western lower tip level to 138m.
- Creation of top soil storage dump D5 along part of the northern PPA boundary (Brown's Wood area) and allowed to develop to '*moorland/rough grass*'.
- Retention of remaining areas of '*moorland/rough grass*' on Crownhill Down.

4.6 Landscape Development – Approx. 10 year after start of Production (Fig. 4.2)

- Rim of mine not extended during the phase but excavation to 110m AOD.
- The maximum footprint of the tip is reached.
- Increase in the height of the tip from west to east reaching a plateau at 160m with a maximum height of 180m.
- The eastern boundary of the tip increases in height westwards to the tailings lagoon, reaching 200m.
- The tailings lagoon is enlarged below 180m.
- Soil storage dump D3 is removed consequent to gradual restoration of the tip.
- Further small areas of woodland planted along part of north-western and part southern tip boundaries to 160m maximum.
- Further establishment of '*moorland/rough grass*' variously on western (to 160m), northern (to 180m), southern (to 190m) and eastern (to 200m) tip margins.
- The only area of semi-natural vegetation remaining on Crownhill Down/Smallhanger Waste within the PPA is located between the foot of the tip on its eastern margin, the eastern boundary of the PPA and to the north of soil storage dump D3.

4.7 Landscape Development – Approx. 15 year after start of Production (Fig. 4.3)

- The mine reaches its maximum extent with excavation to 20m AOD.
- The tip increases in height reaching a plateau at 200m (with 1:2.5 slopes).
- The tailings lagoon is located in a bowl/depression within the tip.
- Further small areas of woodland planted to part northern (between 160-200m) and part southern (between 170-200m) tip boundaries.
- Further establishment of '*moorland/rough grass*' on all tip margins at between 160-200m.

4.8 Final Landscape Objective – After end of Operations (Fig. 4.4)

- Mine excavation completed. The void is allowed to flood to natural ground water level.
- Plant dismantled. Top soil stored in dumps D1, D2 and D4 is used to re-establish '*moorland/rough grass*', together with areas of woodland.

- The tip is capped forming a plateau at 215m AOD. Remaining areas of the tip are restored predominantly to '*moorland/rough grass*', together with woodland (long narrow strip extending across the plateau from north to south) and a small area of '*wetland*' on part of the site of the former tailings lagoon.

4.9 During nearly a quarter of a century since the landscape and restoration scheme was devised and consented more rigorous 'tools' have been made available to ecologists to interpret habitats and position them in an appropriate geographical context and more extensive species surveys have been conducted at a local, county and national level enabling a better understanding of distribution and status. In addition, greater experience of habitat creation and restoration have enabled a more refined understanding of the processes involved.

4.10 The consented scheme would appear, for the most part, to seek to re-instate something of the habitats and landscape of the site, as existing at the time. There is, however, only token acknowledgement of the enormous changes that would occur and of the new ecological landscape that would be created consequent to the proposal. The scheme is also somewhat divorced from the extensive post- and active industrial landscape of the adjoining China Clay mineral workings, the legacy of tungsten and tin working in the area, and the influence these have had and continue to have on the ecology and landscape of the wider area.

5.0 Revised Working and Restoration Strategy

5.1 It is acknowledged that the consented Hemerdon Mine proposals will significantly modify the local landscape and have an impact on the biodiversity of the site variously in the short and medium term. It is also recognised that the mineral industry can have an important part to play in both conserving biodiversity and achieving tangible benefits for biodiversity through appropriate site restoration (EN, QPA & S&MSA, 1999; Davies, 2006) as well as furthering Biodiversity Action Plan (BAP) targets at national, regional and county levels (UKBSG, 1995; Cordrey, 1997; UKBG, 1998-99; DBP, 1998, 2005; White and Gilbert, 2003).

5.2 It is deemed desirable for consideration of the relationship of the Hemerdon Mine site to the wider pattern of habitats in the area, having regard to the significant ecological

changes that have occurred over the years within the local landscape³. It is also necessary to consider what would be now acceptable or desirable and, importantly, what may be realistically achievable within the framework of the extant consent and which would not frustrate the development objectives.

- 5.3 To that end the following principles have been adopted to guide the working and restoration strategy of the Hemerdon Mine site, namely Retention and Incorporation, Avoidance, Enhancement, Restoration, Compensation, Management and Monitoring (adapted from ALGE and the South West Biodiversity Partnership, 2000). This overall approach concurs with Planning Policy Statement 9 (ODPM, 2005) which identifies that in developments where harm to or loss of biodiversity cannot be prevented or adequately mitigated against then appropriate compensation measures should be proposed.

6.0 Defining Principles

Retention and Incorporation

- 6.1 **The strategy will seek, where possible, to retain and incorporate in the development layout those areas of the PPA where existing key habitats and species⁴, buffer areas and other landscape features are of importance for biodiversity and landscape diversity and quality.**
- 6.2 The strategy will seek to retain and incorporate peripheral zones, particularly hedgerows, woodland and other habitat and landscape features (including the Hooksburry Mire, part of Lower Hooksburry Wood and heathland adjacent the eastern PPA boundary).
- 6.3 The strategy will seek to retain and incorporate woodland, stream, open water and other habitat and landscape features within the Smallhanger Brook corridor.
- 6.4 The strategy will seek to retain and incorporate structurally complex habitat features within the Smallhanger Brook corridor for the benefit of bat species (including Greater Horseshoe), enabling the species continued access into and through the site.

³ Includes changes outside of the Hemerdon Mine site such as that brought about by the China Clay industry as well as within the Hemerdon Mine site such as to the vegetation of Crownhill Down consequent to unsympathetic management (Hughes, 2009).

⁴ UK and Devon BAP habitats and species.

6.5 Residential properties and associated buildings and structures within the Smallhanger Brook corridor will be retained. This will be of benefit for roosting bat species (including possible Greater Horseshoe).

Avoidance

6.6 **The strategy will seek, where possible, to avoid or reduce direct and indirect impact both on those areas of the PPA where existing key habitats and species, buffer areas and other landscape features are of importance for biodiversity, landscape diversity and quality as well as new habitats developed through *Enhancement, Restoration and Compensation* proposals.**

6.7 The review and background studies have identified that consented development works will avoid a number of areas recognised to be of biodiversity and landscape importance within and adjoining the PPA (as identified at 6.1-6.5 above). All effort will be made to avoid or reduce impact to those habitats and features for the duration of the works.

Enhancement

6.8 **The strategy will seek to enhance the overall biodiversity, landscape diversity and quality of the PPA during the life-time of the working.**

6.9 Of necessity the strategy will seek to 'build' on existing habitats and features of biodiversity and landscape significance through the various phases of the development. Initial and continuing development phases will involve enhancing existing areas in terms of their quality, extent, capacity, structure and function and their relationship to the biodiversity of the wider countryside.

6.10 The opportunity presents to improve the management of existing extensive areas of acid grassland on Crownhill Down which would not be affected by the proposal until 5 years into the scheme. This could be beneficial as part of eventual heath and grassland restoration.

- 6.11 The opportunity presents to provide enhanced design for wildlife of proposed new water management features.
- 6.12 The permitted scheme will result in significant landscape change. While this is inevitable, the new landform, on completion of operations, can be incorporated into the evolving wider landscape of the area in a manner which reflects local Landscape Character Types⁵.

Restoration

- 6.13 **The strategy will seek to restore and, where feasible or appropriate, link and connect existing habitats and landscape features of biodiversity importance.**
- 6.14 During the life-time of the working the strategy will seek to ensure well co-ordinated progressive restoration operations. This will include phased re-creation of those habitats and landscape features of biodiversity importance, where feasible or appropriate, as well as creating a foundation for a diverse landscape.
- 6.15 The permitted scheme is dominated by the restoration to '*moorland*' of an unspecified nature. Through the new strategy all reasonable effort will be made to ensure restoration to more specific habitat types including a broad mosaic of heath and acid grassland communities⁶, with heathland the dominant habitat type. The opportunity also exists for the restoration of broadleaved woodland, mire habitats on tip areas and the creation of new wetland habitats such as ditches, ponds and seepage zones as part of the overall management of the surface and ground water of the site.

Compensation

- 6.16 **The strategy will seek to compensate for features of wildlife importance which will be lost to the development.**
- 6.17 This can be achieved through the re-creation of habitat features where appropriate or feasible, restoration and enhancement of habitat features unaffected by the

⁵ As defined in South Hams District Council's Landscape Character Assessment.

⁶ Restoration to vegetation communities appropriate to the area, namely dwarf-shrub heathland of the H4-type and bent-fescue and rough moorland grassland of the U3/U4-type.

development, creation of new habitat features and buffer zones and the translocation of species (eg. reptiles) that would otherwise be lost.

Management

- 6.18 **The strategy will seek to manage retained, enhanced, restored and newly created habitats of importance for wildlife with the aim of maintaining or achieving favourable conservation status. The strategy will additionally seek to manage retained and newly created landscape features.**
- 6.19 It will be necessary to put in place appropriate programmes for the positive management of habitats and landscape features, as part of the long-term operational management of the PPA, for the duration of the proposal and after-care period.

Monitoring

- 6.20 **The strategy will seek to monitor retained, enhanced, restored and newly created habitats and landscape features of importance for biodiversity.**
- 6.21 It will be necessary to ensure that retained, enhanced, restored and newly created habitats and landscape features continue to encourage successfully the migration, dispersal and genetic exchange of wild fauna and flora.

7.0 Restoration Concept

- 7.1 Based on the aforementioned *Defining principles*, Drawing nos. 16349-2 to 16349-6 provide the **indicative** restoration concepts devised for the duration of the proposed working.

The ecological and landscape restoration proposals will be guided by the following concepts:

- 7.2 Proposed areas of broadleaf tree planting variously serve as landscape screening, to re-inforce or extend existing boundaries, to re-inforce or extend retained woodland areas, to ensure linkage into and through the site and to create new woodland habitat. Where

landscape/screening objectives may be paramount during operational phases then such planting may initially be dense, then thinned out when screening is no longer so critical. Where ecological considerations may be of greater significance then it is proposed that such planting (ie. on developing tip faces) should be open rather than dense with a view to creating a mosaic with restored grassland and/or heathland. Tree and shrub species to be planted will replicate those already found in the general locality as well as reflect local soil moisture and chemistry conditions, as appropriate.

- 7.3 Stripped soils, variously peat, woodland and agricultural soils, will be stored separately in the identified soil dumps (D1-D5).
- 7.4 Proposed areas of acid grassland and heathland will be restored preferentially to form a mosaic of habitats rather than as separate habitat blocks. The restoration methodology including provenance of seed source will be determined through the various project phases to reflect such factors as tip stability, tip material and restoration experience accrued.
- 7.5 Proposed areas for restoration to grassland/field habitats will be divided into smaller parcels through construction of hedgerows, providing further habitat linkage within and through the site as well as integration into the wider landscape.
- 7.6 Proposed water courses and water bodies, though fulfilling essential operational functions, will be designed in such a way as to enhance their potential for wildlife.

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HEMERDON MINE

Résumé and evaluation of biodiversity findings

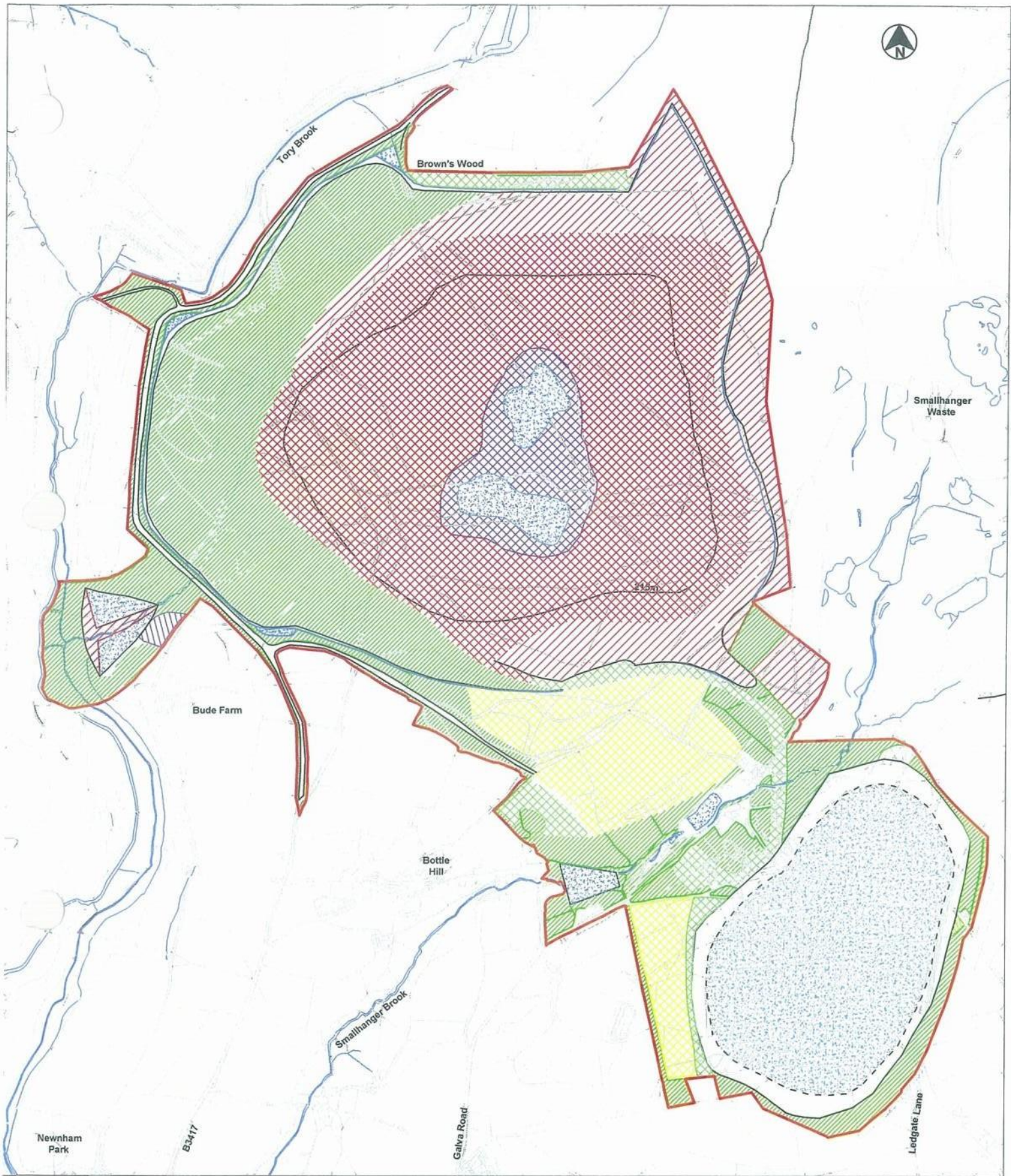
The following is a résumé of the Ecological Site Investigations conducted by Michel Hughes Associates during 2008 (Hughes, 2009).

Hemerdon Mine area

1. The Planning Permission Area (PPA) is identified to support a diversity of habitats including scrub, woodland, hedgerows, wet grassland, acid grassland, semi-improved grassland, improved grassland and heathland. The habitats are identified to comprise a diversity of vegetation communities.
2. The principal areas of scrub and scrub-woodland are identified to have successional development over time on disturbed ground associated with previous mineral working. The vegetation communities of the scrub areas are represented by the *W23c Gorse-Bramble scrub; Wood Sage sub-community* and the *W25b Bracken-Bramble underscrub; Wood Sage sub-community* with the scrub-woodland areas represented by the *W8 Ash-Field Maple-Dog's Mercury woodland* and the *W10 Pedunculate Oak-Bracken-Bramble woodland* communities, transitional to the *W1 Grey Willow-Marsh Bedstraw woodland* community where damper conditions prevail. All of the communities are recognised to be common and widely distributed on suitable soils throughout lowland Britain (Rodwell, 1991a) including Devon.
3. By reference to the wildlife and landscape criteria set out in the Hedgerow Regulations 1997, 19 of the 25 hedgerows assessed within the PPA were determined to be "important" within the meaning of the Regulations. General observation of most other hedgerows within the PPA would suggest that the majority would also qualify as "important" hedgerows.
4. Grassland is identified the most widespread habitat type within the Hemerdon Mine area of the PPA. Most fields were identified to comprise agriculturally 'improved' grassland with affinity variously to a species-poor *MG6b Perennial Rye-grass-Crested Dog's-tail grassland; Sweet Vernal-grass sub-community* or the *MG7 Perennial Rye-grass leys and related grasslands* community. Most are managed as pony paddocks with only relatively few managed with farm livestock. Both communities are ubiquitous throughout the British lowlands (Rodwell, 1992) and they are generally considered to be ecologically dull. In a few, mainly steep, north-facing fields the derivation of the *MG6b* grassland from the previous *U4a Sheep's-fescue-Common Bent-Heath Bedstraw grassland; Typical sub-community* can be detected in peripheral areas through the presence of a few plant species more characteristic of calcifugous grassland than the present more mesotrophic-type grassland. Bracken spreading from the margins is a particular feature of several fields.
5. Pools are represented by a small, shallow, wet depression within the area of the lower mine excavation and within an area developed with heathland vegetation above the main mine working. Though no overall vegetation community was discerned, the moderate diversity of plant species found at the former site are characteristic of the *M35 Round-leaved Crowfoot-Blinks rill* community and the generally low-diversity flora of the latter have affinity to the *OV35 Water-purslane-Lesser Spearwort community*. All owe their

existence to human activity, namely past mineral working and recent off-road recreational vehicles.

6. Small fragments of heathland vegetation with affinity to the *H4c Western Gorse-Bristle Bent heath; Cross-leaved Heath sub-community* (Rodwell, 1991b) are located on the higher ground above the main mine working. The vegetation is maintained close-grazed by rabbits and is fragmented and disturbed from the activity of scramble bikes, 4x4 off-road vehicles and drilling operations. It is not considered to be of particular nature conservation significance given its very small extent and fragmented nature nor able to support and maintain a balanced, integrated and adaptive community of heathland species.
7. A total of 185 species of plants were recorded from the Hemerdon Mine area comprising 10 species of ferns and allies, 27 species of trees and shrubs, 21 species of grasses, 14 species of sedges and rushes and 113 other vascular plant species. Of these, bee orchid, royal fern and round-leaved crowfoot are categorised as *Devon Notable* species (DBRC, 2008). The majority of species are typically associated with the habitats present and considered to be common and/or widespread where similar conditions prevail, within their geographical range (Ivimey-Cook, 1984; Stewart *et al.*, 1994; Wigginton, 1999; Preston *et al.*, 2002; Cheffings *et al.*, 2005).
8. The overall level of bat activity throughout the built area of the PPA was found to be low with one building confirmed as a roost for a maximum of 3 common pipistrelle bats, the pump house and associated lagoon confirmed as a foraging area but could not be confirmed as a roost site for common pipistrelle bats, and a brown long-eared bat and *Myotis* bat species were recorded foraging along the wooded track to the north of the buildings. It can be concluded that individual bats might be roosting on site or commuting onto site from nearby buildings. The survey data supports the conclusion that roosts contained within the accessed areas of the PPA almost certainly range from low to at best moderate conservation significance and when considered in a county context the bat fauna can be considered typical for rural Devon. Though greater horseshoe bats were recorded within the Crownhill Down area of the PPA there was no evidence to suggest that any mine building or structure or any residential property in close proximity to the mine buildings contained a breeding or hibernation site for these bats.
9. No evidence for the presence of dormice was identified. It can be concluded with a high degree of certainty that dormice are not present within the Hemerdon Mine area. The absence of nests from the internal areas of the site may be a reflection of the overall poor habitat conditions and the species mix present.
10. A survey of badger activity identified a two entrance *outlier sett* within the complex of disused mine building structures together with a considerable network of associated paths and evidence of foraging activity. A *main sett* was not located within the PPA. A small diversity of common and widespread mammal species were additionally recorded.
11. A total of 40 species of birds were observed or heard within or over at least part of the Hemerdon Mine area of which 25 species were identified nesting within or holding a breeding territory over at least part of the site. The breeding assemblage of bird species is assessed to be of reasonable diversity, comprising a range of essentially widespread and/or common species (Gregory *et al.*, 2002; Reay and Lock, 2007), typically associated with the habitats found within the site and the surrounding local enclosed landscape.



MICHEL HUGHES ASSOCIATES

WOLF Minerals Limited

Client: Wolf Minerals Limited

Project: Hemerdon

Title: Indicative Restoration Concept
Final objective after end of operations

Drawing: 16349-6

Drawn by: MV Checked by: MRH

Scale: NTS Date: Sept 2009

Existing		Proposed	
Planning Permission Area (PPA)	D4 Top soil dump	Improved grassland	Potential area for restoration to grassland/fields/hedgerow habitats
Broadleaf woodland	Broadleaf planting	Acid grassland	Potential area for predominantly heathland with associated acid grassland habitat restoration
Hedgerow	Hedgerow	Heathland	Potential area for mire habitat
		Mire	
		Water course/body	Water course/body

12. The sole reptile identified within the Hemerdon Mine area was common lizard which is a common and widespread species in Devon.
13. A total of 17 butterfly species were recorded all of which are listed in the Low Butterfly Conservation priority category generally considered to be widespread and/or common, both nationally (Asher *et al.*, 2000; Fox *et al.*, 2006) and in Devon (Bristow *et al.*, 1993).
14. **The range of habitats and species reflects the local characteristics of man-influenced and semi-natural habitats as well as past and present land-use.**

Crownhill Down area

15. The PPA is identified to support a diversity of habitats including dry heathland, wet heathland, flushes and mires, heath grassland, acid grassland, improved grassland, scrub, pasture woodland and conifer plantation. The habitats are identified to comprise a diversity of vegetation communities.
16. Fields within the Crownhill Down area of the PPA are all identified to comprise agriculturally 'improved' grassland variously managed as pony paddocks or with farm livestock. Their vegetation comprises either species-poor *MG6b Perennial Rye-grass-Crested Dog's-tail grassland*; *Sweet Vernal-grass sub-community* or the *MG7 Perennial Rye-grass leys and related grasslands* community, treatment-derived mesotrophic swards developed from previous calcifugous grassland. Both grassland communities are ubiquitous throughout the British lowlands (Rodwell, 1992) and are generally considered to be ecologically dull.
17. Areas of conifer and mixed conifer-broadleaved plantation are identified to be of overall low nature conservation significance. Lower Hooksburry Wood is included as part of the Newnham Estate's 4x4 off-road and mountain bike course and as such considerable parts have been affected by those activities.
18. Wood pasture is represented solely from that part of Lower Hooksburry Wood which is unenclosed and forms part of Crownhill Down. The vegetation of the relatively small area of grazed woodland supporting many old-growth trees is identified to comprise the *W11a Sessile Oak-Downy Birch-Wood-sorrel woodland*; *Broad Buckler-fern sub-community* and the *W17c Sessile Oak-Downy Birch-Dicranum majus woodland*; *Sweet Vernal-grass-Common Bent sub-community* (Rodwell, 1991a). Both communities are included in the category 'Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles' which is recognised to be of European importance through listing in Annex 1 of the European Union Habitats Directive (92/43/EEC). A considerable diversity of epiphytic lichen species have been recorded, numerous of which are Red Data Book, Nationally Rare, Nationally Scarce or ancient woodland indicator species (Sanderson and Cross, 2004). The woodland is identified to be of considerable nature conservation significance.
19. Areas of mire vegetation are found solely in lower-lying ground to the west of the B3417. The vegetation type is best represented by a 0.5ha spring-line mire located below Bude Farm which supports a diverse flora with affinity to the *M25a Purple Moor-grass-Tormentil mire*; *Cross-leaved Heath sub-community* and small quantities of the *M21a Bog Asphodel-Sphagnum papillosum valley mire*; *White Beak-sedge-Sphagnum denticulatum sub-community* (Rodwell, 1991b). Wet scrub woodland developed on the slope below the mire demonstrates successional development of the mire to its woodland counterpart the *W4b Downy Birch-Purple Moor-grass woodland*; *Soft-rush*

sub-community (Rodwell, 1991a). The largest extent of mire vegetation is located within an area of historic tin workings and comprises a network of seepage zones, runnels and small pools between ridges, providing down-slope transition from the *M16a Cross-leaved Heath wet heath; Typical sub-community* to the *M21a Bog Asphodel-Sphagnum papillosum valley mire; White Beak-sedge-Sphagnum denticulatum sub-community* with central tracks containing the *M29 Marsh St. John's-wort-Bog Pondweed soakway community* and occasional small patches of the *M6dii Star Sedge-Sphagnum fallax/denticulatum mire; Sharp-flowered Rush sub-community; Sphagnum denticulatum variant*. The *M16a* and *M21a* communities are both listed on Annex 1 of the European Union Habitats Directive, the former included in the category of 'North Atlantic wet heaths with *Erica tetralix*', the latter included in the category of 'Depressions on peat substrates of the Rhynchosporion', and as such both are recognised to be of European importance. Although the *M29* community is not listed on Annex 1, its overall limited distribution identifies it to be of national significance. The mire below Bude Farm is evaluated to be of considerable nature conservation significance in a local context. The sequence of runnels and small mires associated with the area of tin workings are collectively assessed to be of nature conservation significance in a local context. Uncontrolled access by mountain bikes, scramble bikes and 4x4 off-road vehicles has caused considerable damage to the mire communities within the tin working area, with the largest single area of mire found reduced to a 'mud-wallow' in March 2009.

20. Acid grassland habitat is found primarily in the area to the west of the B3417, the margins of the B3417 and a south-eastern peripheral area. It comprises close-grazed calcifugous grassland (Rodwell, 1992) with affinity to the *U4a Sheep's-fescue-Common Bent-Heath Bedstraw grassland; Typical sub-community*, variously with bracken and/or gorse often dominant. At a few locations along the B3417 verges, somewhat more raised ground supports small areas of the *U1e Sheep's-fescue-Common Bent-Sheep's Sorrel grassland; Heath Bedstraw-Tormentil sub-community*. On their own these areas of grassland would not be considered of particular nature conservation significance. However, the presence of such quantity of the *Nationally Scarce* plant chamomile as well as heath dog-violet and cornish moneywort identifies them to be of high nature conservation significance in a county context (DBRC, 2008). None of these communities are afforded particular status through the EU Habitats Directive. Those areas adjacent to the west of the road are extensively used for recreational purposes with localised erosion of the ground along tracks and more regularly used parking areas. A significant section at the eastern margins of the B3417 has been subject to disturbance consequent to drainage operations and gorse cutting.
21. Heath grassland comprises the largest habitat area on Crownhill Down which extends over most of the northern sector of the PPA and part of the southern sector. It comprises an overwhelmingly grass-dominated sward with affinity to the *U3 Bristle Bent grassland community*, with only a low-diversity of other heathland species, all at low cover values. It is recognised as a treatment-derived community (Rodwell, 1992), consequent to over-frequent burning and excessive grazing, effectively a seriously degraded *H4* heathland community. It is identified as particularly extensive around the upland fringes of the south-west with strong representation around Dartmoor (Rodwell, 1992).
22. Heathland habitat was identified restricted to reasonably well-defined areas on Crownhill Down and that part of Smallhanger Waste within the PPA. The area of historic tin workings supports extensive closely grazed, regenerating heathland with affinity to the *H4a Western Gorse-Bristle Bent heath; Bristle Bent-Bell Heather sub-community*, together with abundant bracken and regenerating gorse. Closely grazed heathland with more elevated soil-moisture level to the northern margin of the main tin working zone

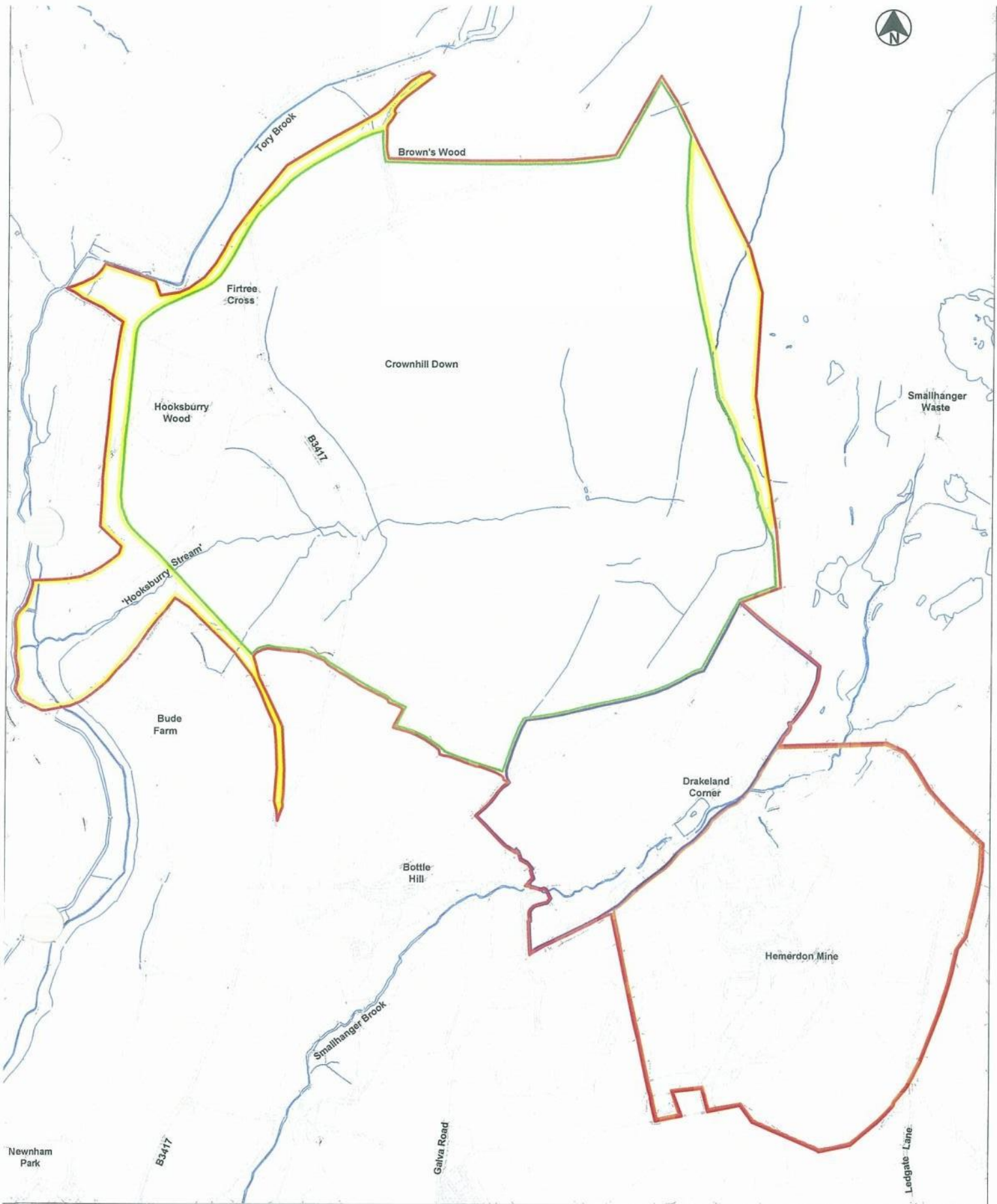
- provides a transition to the *H4c Western Gorse-Bristle Bent heath; Cross-leaved Heath sub-community*. The area with the best heathland is identified from the highest ground within the PPA, which through the presence of deer-grass marks the transition from lowland heath *H4c* sub-community to more upland-type heath *H4d Western Gorse-Bristle Bent heath; Deer-grass sub-community*. The heath is, however, grazed too close and grass species have already become a significant component. The process of replacement of the *H4* heathland by *U3* grassland, with consequent further decline in the overall nature conservation value of the site, would seem inevitable given the current management régime. The *H4* heathland community is confined to south-west Britain, with the *H4a* sub-community the commonest lowland heathland community in Devon and the *H4c* sub-community well represented in Devon including on the lower-lying margins of Dartmoor (Rodwell, 1991b). The importance of *H4* heathland communities is recognised through their inclusion in the habitat category 'European dry heaths' which is listed on Annex 1 of the EU Habitats Directive.
23. Gorse and bracken scrub occurs in a number of areas on Crownhill Down, occurring in large blocks comprising variously the *U20a Bracken-Heath Bedstraw community; Sweet Vernal-grass sub-community* and the *W23a Gorse-Bramble scrub; Sweet Vernal-grass sub-community*, mainly as mixed community stands in a wider mosaic with close-grazed *U4a Sheep's-fescue-Common Bent-Heath Bedstraw grassland; Typical sub-community*. The particular scrub communities are ubiquitous in the British lowlands and their extent at this site is considerable. The value of these scrub areas for breeding bird species (ie. Dartford warbler, yellowhammer and stonechat) is recognised.
 24. Nine very small peaty pools were identified primarily within the more elevated area of historic tin workings. All are widely used as 'watering holes' by livestock and at several their margins were found to be heavily poached and the pools reduced to 'mud-wallows' with generally little or no aquatic vegetation. Given their present heavy usage by livestock and consequent physical condition none of the pools were considered to be of specific nature conservation significance at the time of the study. This is in contrast to the significant resource of ponds, permanent pools and ephemeral pools within the core part of Smallhanger Waste (outside of the PPA), whose significance for dragonflies, damselflies and scarce plants is well-documented.
 25. A total of 144 species of plants were recorded from the Crownhill Down area comprising 7 species of ferns and allies, 23 species of trees and shrubs, 16 species of grasses, 18 species of sedges and rushes and 80 other vascular plant species. Of these, chamomile, royal fern, Cornish moneywort, round-leaved crowfoot, heath dog-violet and ivy-leaved bellflower are categorised as *Devon Notable* species (DBRC, 2008), with chamomile listed as *Red Data Book 'Vulnerable'*, heath dog-violet and ivy-leaved bellflower listed as *Red Data Book 'Near Threatened'* and chamomile and cornish moneywort categorised as *Nationally Scarce*. The majority of species are typically associated with the habitats present and considered to be common and/or widespread where similar conditions prevail, within their geographical range (Ivimey-Cook, 1984; Stewart *et al.*, 1994; Wigginton, 1999; Preston *et al.*, 2002; Cheffings *et al.*, 2005).
 26. Surveys of bats found that the sheltered track leading to the fishing ponds on Smallhanger Waste was used by a low number of greater horseshoe bats, most likely roosting nearby (possibly within barns or outbuildings of properties identified as Claymoor House and Smallhanger). The eastern PPA boundary was heavily used by common and soprano pipistrelle bats indicating that local properties might support roosts of these species. The central areas of Crownhill Down were only occasionally used by bats. The western boundary of the PPA adjoining Newnham Park was also used by low

numbers of greater horseshoe bats thought to be roosting nearby. The sheltered area to the south of the Mica dam exhibited a moderate to high level of pipistrelle and Daubenton's bat activity with a locally important foraging and commuting route for these otherwise common species located within wet woodland and a sheltered road cutting. When considered within a county context the bat fauna would be considered typical for rural Devon.







27. A total of 41 species of birds were observed or heard within or over at least part of the Crownhill Down area of which 24 species were identified nesting within or holding a breeding territory over at least part of the site. Of particular significance was the presence of nightjar and Dartford Warbler which are afforded specific protection at a European level through being listed on Annex 1 of the *EU Birds Directive*, together with other species such as cuckoo, meadow pipit, stonechat, mistle thrush, skylark, linnet and yellowhammer which are variously listed as *UKBAP* species and on the *Red or Amber List of species of conservation concern*. The combined Crownhill Down and Smallhanger Waste area is considered to support a significant assemblage of species, typical of the habitats present, their extent and management condition, within their geographical range.
28. Diverse aquatic macro-invertebrate communities, indicative of good water quality, were recorded at all eight sampling sites on the Smallhanger Brook and a tributary as well as on the 'Hooksburry Stream'. The highest diversity of taxa was recorded at site 2 at Drakeland Corner, with site 3 on Smallhanger Waste identified to have the greatest conservation importance. *Nationally Scarce* (Notable) species recorded included the whirligig beetle *Gyrinus urinator* (sites 1,2,3, C and D), the water scavenger beetle *Laccobius atratus* (site 3) and nymphs of the small red damselfly *Ceriatrion tenellum* (sites 2 and 3). A single larva of the 'Local' alderfly species *Sialis fuliginosa* was collected at site 4. The distribution of brown trout and eel within the Smallhanger Brook remains essentially similar to that previously recorded in 1978-79 (Cramer and Warner, 1979).
29. Adder and common lizard were identified on Crownhill Down and together with grass snake were also recorded from that part of Smallhanger Waste within the PPA. Adder was only seen occasionally, common lizard on every survey visit and grass snake on a single occasion in lower-lying ground near Drakeland Corner. The species recorded are those which would be expected for the habitats present within the site, within their geographical range. The same species were also recorded from the adjacent Headon Clay Works during 2008 (J. Andrews, *pers. comm.*). All three are common and widespread in Devon. The three species are afforded protection through listing on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and are identified on the *UK List of Priority Species* (*UKBAP* species).
30. A total of 20 butterfly species were recorded from the Crownhill Down area. Small heath and grayling, which were commonly seen, are listed as *UKBAP* species with silver-washed fritillary identified as a *Species of Conservation Concern*. All other species are listed in the Low Butterfly Conservation priority category and are generally considered to be widespread and/or common, both nationally (Asher *et al.*, 2000; Fox *et al.*, 2006) and in Devon (Bristow *et al.*, 1993).
31. A total of 15 dragonfly and damselfly species were recorded from the area of flushes, runnels and pools within the historic tin workings to the west of the B3417 road. Of these the small red damselfly is recognised as a *Nationally Important Species* due to its overall national scarcity. The site is evaluated to support a moderate fauna in a Devon context

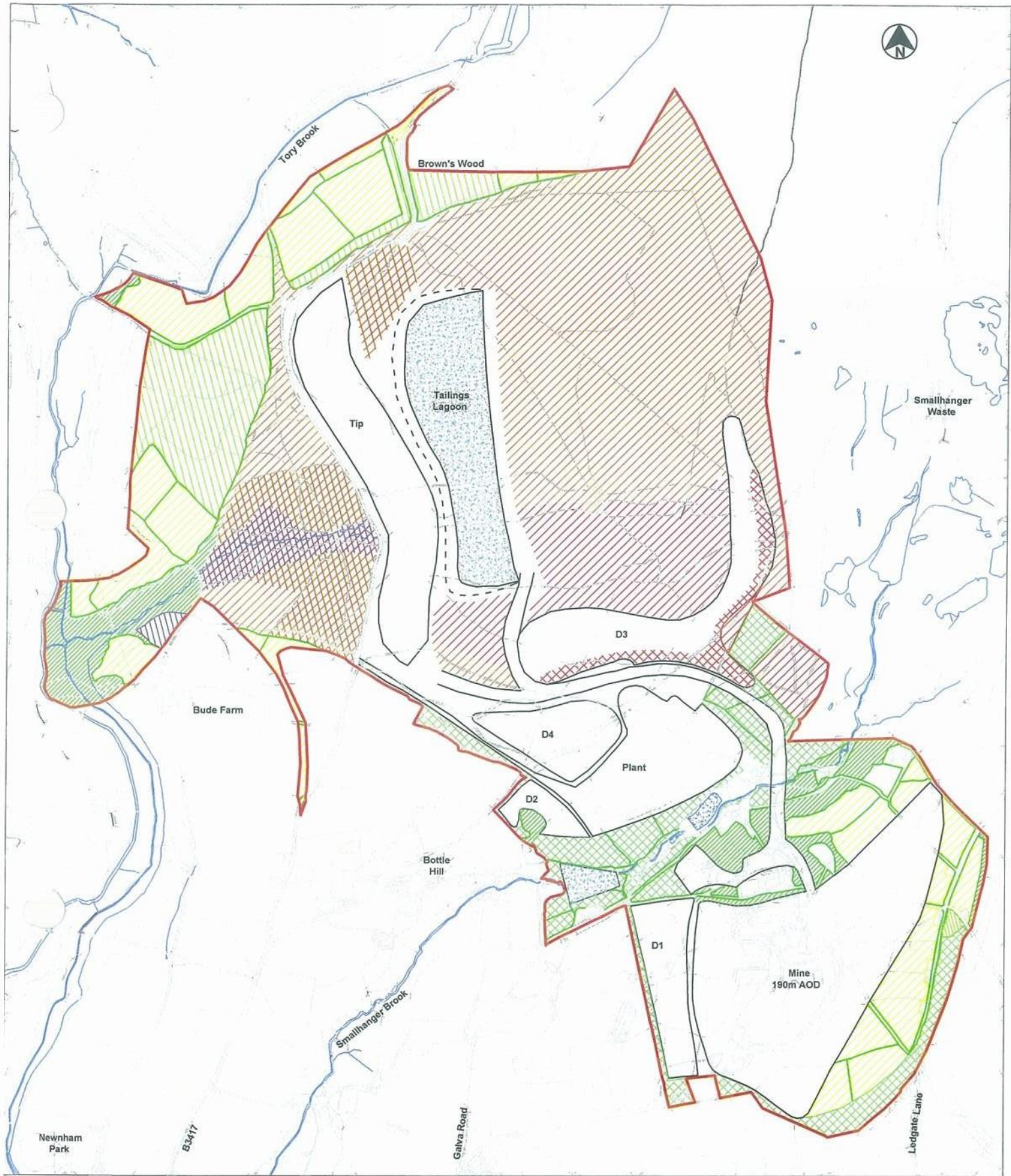
(French and Smallshire, 2008; D. Smallshire, *pers. comm.*). However, uncontrolled access by mountain bikes, scramble bikes and 4x4 off-road vehicles has caused considerable damage to the mires with the largest single area reduced to a 'mud-wallow' in March 2009. In contrast, the wetland area on Smallhanger Waste (outside of the PPA), is classified as a *Confirmed Key Site of National Importance* for its fauna.

32. **The range of habitats and species within the Crownhill Down area reflects the local characteristics of man-influenced and semi-natural habitats as well as past and present land-use and management.**



Client: Wolf Minerals Limited
 Project: Hemerdon
 Title: Consented Areas - 1986
 Drawing: 16349-1
 Drawn by: MV Checked by: MRH
 Scale: NTS Date: June 2009

-  Planning Permission Area
-  Additional land in permission
-  Hemerdon Mine Area
-  Water courses/water bodies
-  Processing Plant Area
-  Tip site



WOLF Minerals Limited

Client: Wolf Minerals Limited

Project: Hemerdon

Title: Indicative Restoration Concept
Approx. 1 year after start

Drawing: 16349-2

Drawn by: MV Checked by: MRH

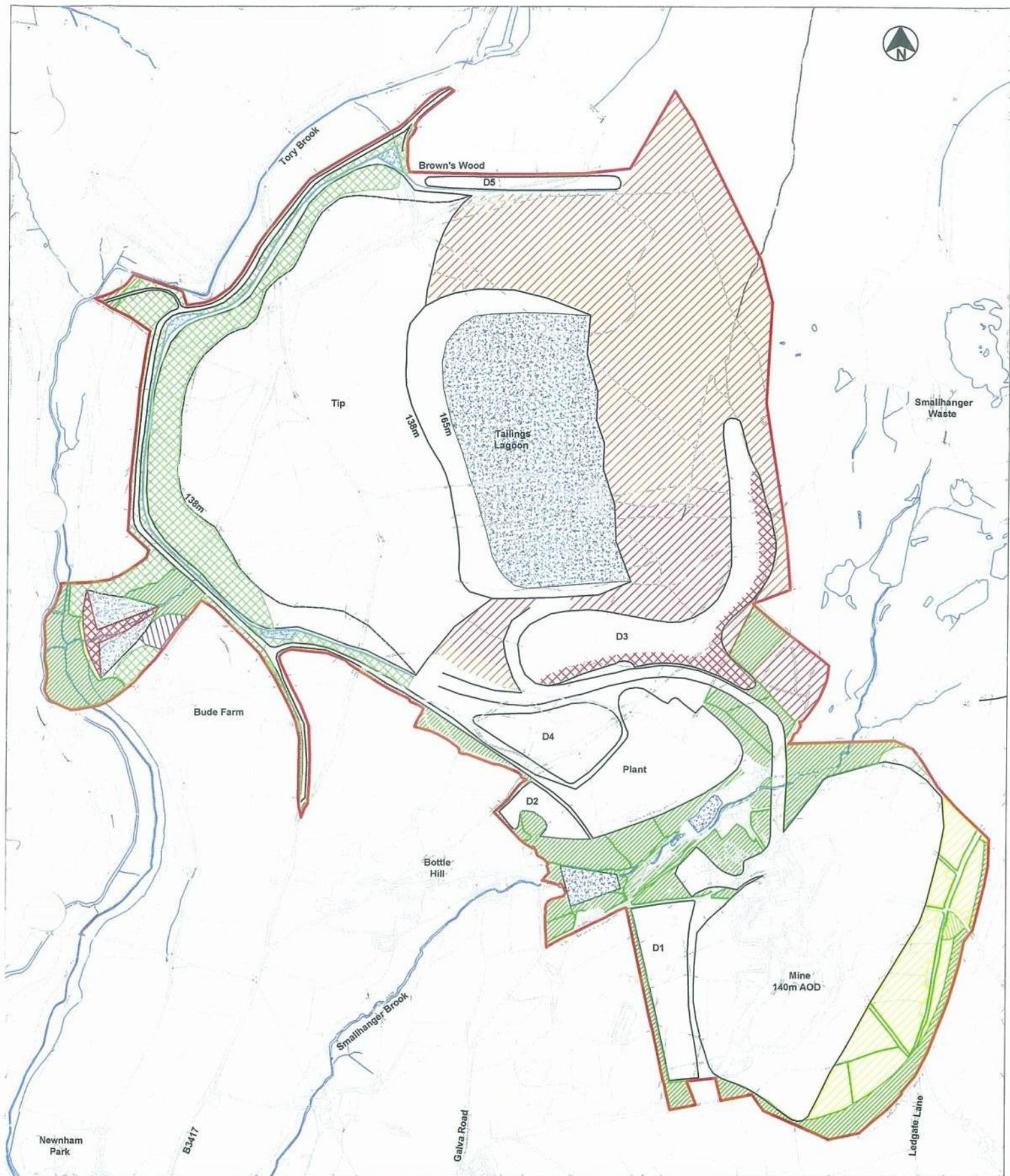
Scale: NTS Date: Sept 2009

- Existing**
- Planning Permission Area (PPA)
 - Conifer/Broadleaf plantation
 - Broadleaf woodland (W1 W4 W8 W10 W11 W17)
 - Scrub (W23 W25)
 - Hedgerow


- Proposed**
- D4 Top soil dump
 - Broadleaf planting
 - Hedgerow

- Existing**
- Improved grassland (MG6 MG7)
 - Acid grassland (U1 U3 U4 U20)
 - Heathland (H4)
 - Mire (M6 M21 M25 M29)
 - Water course/body

- Proposed**
- Potential area for restoration to grassland/fields/hedgerow habitats
 - Potential area for predominantly heathland with associated acid grassland habitat restoration
 - Potential area for mire habitat
 - Water course/body



Client: Wolf Minerals Limited
Project: Hemerdon
Title: Indicative Restoration Concept
 Approx. 5 years after start
Drawing: 16349-3
Drawn by: MV **Checked by:** MRH
Scale: NTS **Date:** Sept 2009

 Planning Permission Area (PPA)

 D4 Top soil dump

Existing
 Broadleaf woodland
 Hedgerow

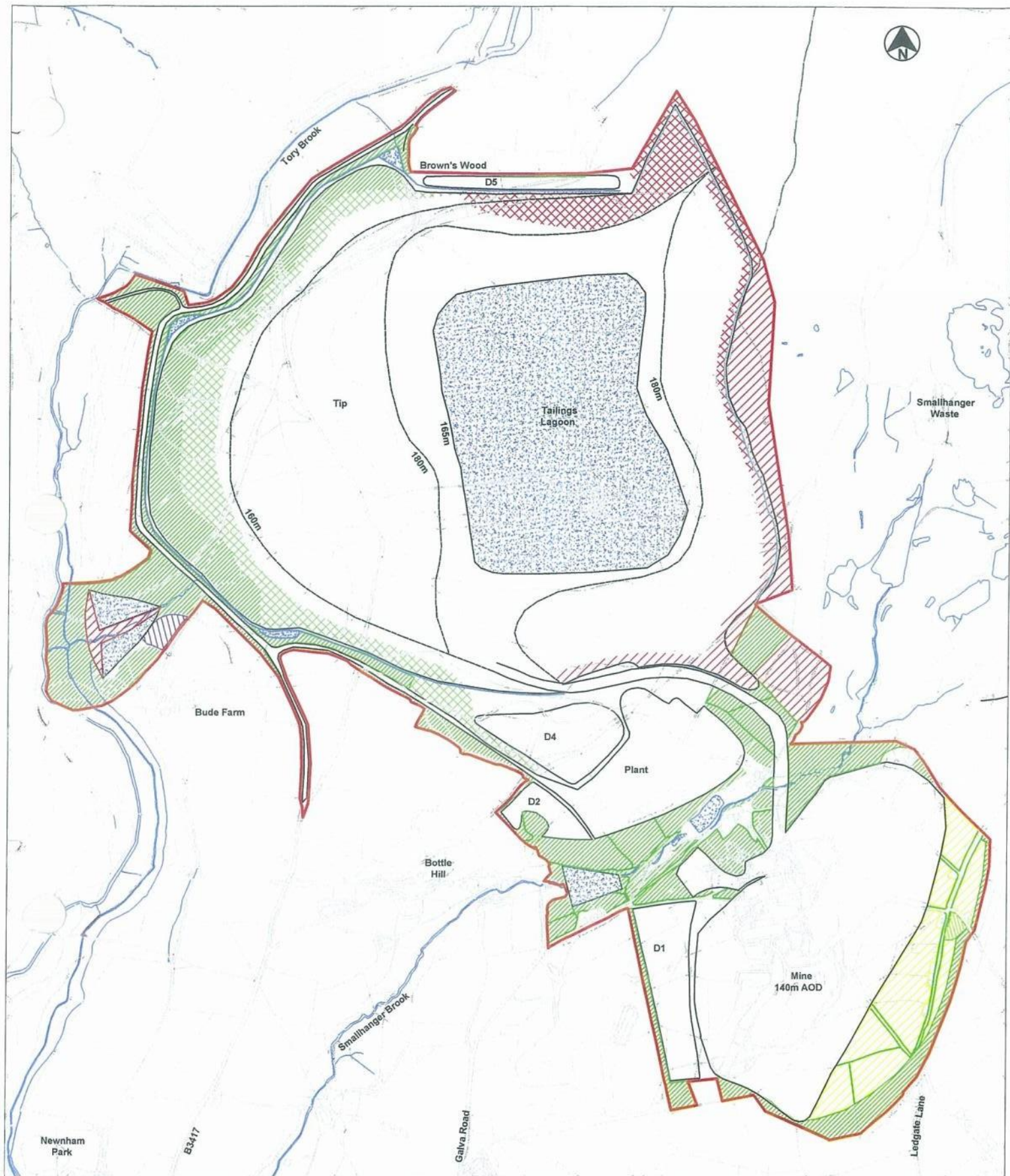
Proposed
 Broadleaf planting
 Hedgerow

Existing

 Improved grassland
 Acid grassland
 Heathland
 Mire
 Water course/body

Proposed

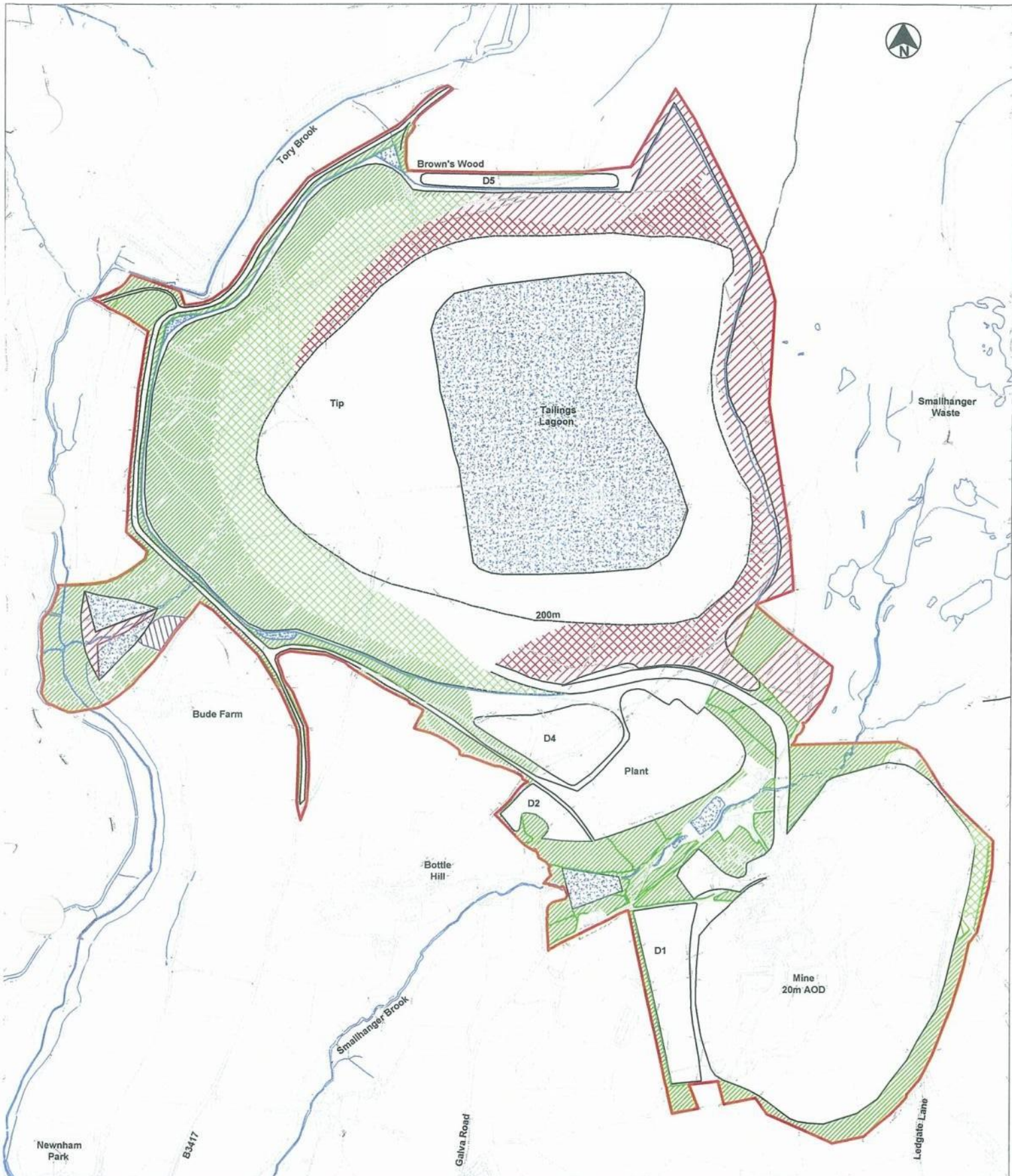
 Potential area for restoration to grassland/fields/hedgerow habitats
 Potential area for predominantly heathland with associated acid grassland habitat restoration
 Potential area for mire habitat
 Water course/body



WOLF
Minerals Limited

Client: Wolf Minerals Limited
Project: Hemerdon
Title: Indicative Restoration Concept
 Approx. 10 years after start
Drawing: 16349-4
Drawn by: MV **Checked by:** MRH
Scale: NTS **Date:** Sept 2009

Existing		Proposed	
Planning Permission Area (PPA)	D4 Top soil dump	Improved grassland	Potential area for restoration to grassland/fields/hedgerow habitats
Broadleaf woodland	Broadleaf planting	Acid grassland	Potential area for predominantly heathland with associated acid grassland habitat restoration
Hedgerow	Hedgerow	Heathland	Potential area for mire habitat
		Mire	Water course/body
		Water course/body	Water course/body



WOLF Minerals Limited

Client: Wolf Minerals Limited

Project: Hemerdon

Title: Indicative Restoration Concept
Approx. 15 years after start

Drawing: 16349-5

Drawn by: MV Checked by: MRH

Scale: NTS Date: Sept 2009

Existing		Proposed	
Planning Permission Area (PPA)	D4 Top soil dump	Improved grassland	Potential area for restoration to grassland/fields/hedgerow habitats
Broadleaf woodland	Broadleaf planting	Acid grassland	Potential area for predominantly heathland with associated acid grassland habitat restoration
Hedgerow	Hedgerow	Heathland	Potential area for mire habitat
		Mire	Water course/body
		Water course/body	Water course/body