Northern Ireland
Fire & Rescue Service

STANDARD OPERATING PROCEDURE NO 32

Wildfire

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Protecting Our Community

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NORTHERN IRELAND FIRE & RESCUE SERVICE

STANDARD OPERATING PROCEDURE NO 32

WILDFIRE

INTRODUCTION

Occasionally, Northern Ireland (NI) will experience prolonged warm dry weather which may cause numerous wildfires over a protracted period of time. Dealing effectively with such a large number of incidents and maintaining fire cover can place a considerable strain on Northern Ireland Fire & Rescue Service (NIFRS) resources.

Firefighting techniques required at wildfires vary significantly from those used in urban areas. Due to the scarcity or absence of water supplies, fires may have to be extinguished partly or entirely by beating and smothering and in some cases being allowed to burn out under a certain degree of control.

Fires may be located considerable distances from accessible roadways and crews may have to transport themselves and equipment over rough terrain under arduous conditions.

Firefighters may be moving continually from incident to incident without respite for their entire shift, or in the case of Retained duty system personnel, working for a number of days with minimal rest time.

Wildfire can have a significant impact on the local economy and environment. More importantly, such events can result in either serious injury or death to members of the public or to operational personnel. In the United Kingdom (UK) there is a lack of understanding of this type of fire and to the dangers involved in its suppression; the inadequate management systems employed by some services and agencies are in themselves a danger to personnel.

This situation is complicated by the fact that wildfire is both seasonal and sporadic, resulting in inexperience and insufficient provision within NIFRS planning. Presently UK Fire & Rescue Services and other agencies are attempting to extinguish wildfires with limited understanding of the phenomena, little or no specialist equipment and limited operational expertise.

This document gives an overview of the procedures and practices that have been adopted by NIFRS. These procedures and practices enable officers to manage rural fires, commonly referred to as wildfires, using safe and effective systems of work.

SOP No 32 – *"Wildfire"*, has been produced in the following format:

SECTION A

Safety-Critical Information

All personnel ***must*** have complete knowledge and understanding of this section to ensure maximum safety at incidents. Section A is designed to reflect the content in the relevant section of the Operational Aide-Mémoire.

SECTION B

Provides More Detailed Information on the Topics Covered in Section A

Personnel ***should*** have a good knowledge of information contained within this section.

SECTION C

Background and Reference Material

This section includes information which personnel ***could*** use for reference material.

It provides details of relevant legislation and reference material used during SOP development.

1 – SECTION A

1.1 DEFINITION OF A WILDFIRE

- A wildfire is a generic term used to describe any uncontrolled fire in various types of vegetation. The vegetation involved can include grass, crops, bracken, heather, trees and gorse.

- Wildfires vary in size from a few square metres to an incident involving hundreds of hectares of varying vegetation. Wildfires can have a significant impact on NIFRS, especially during spate conditions where they can impact significantly on resilience.

- Wildfire incidents are inherently dangerous. It is imperative that safe systems of work are adopted from the outset. The Incident Commander (IC) must carry out a comprehensive Dynamic Risk Assessment (DRA) and brief all personnel on the risks and precautions to be taken. Due to the rapidly changing fire environment at such incidents, the risk assessment review process should be continuous.

1.2 OPERATIONAL CONSIDERATIONS/TACTICS

1.2.1 ON ARRIVAL

- As part of an initial DRA, and when formulating a Firefighting Plan, the IC should consider the following:

  - the type of fuel involved and its height (eg, grass, trees, bracken, gorse or mixed fuels);

  - the alignment factors (wind, slope, aspect) at the present time and what they are anticipated to be within 30 minutes;

  - the potential for fire-spread;

  - the risk to life, property, livestock, forestry and the environment.

- Implementation of NIFRS Incident Command System (ICS), including radio communications, shall take place at an early stage, as well as any requirement for assistance considered and ordered on as soon as possible, considering travel times. Resources required will be dependent on the Tactical Plan.

1.2.2 LEAVING WILDFIRES TO BURN

Rarely do wildfires initially involve life risk. On most occasions it is NIFRS that inserts the life risk by committing crews, and NIFRS should consider this very carefully. Whilst not adopted as standard practice, NIFRS should actively consider allowing a wildfire to burn.

If it is decided to allow a wildfire to burn, NIFRS should factor the following into a risk assessment:

- the risk to life, property, livestock, forestry, wildlife and the environment;
- the time of day;
- the ground conditions and topography;
- location of critical Infrastructure, eg, power lines, water catchments, etc;
- location of fire breaks, both natural and man-made, or consideration of the laying of a Compressed Air Form blanket to protect property or create a fire break;
- the potential for the fuel to run out;
- maintaining an NIFRS presence at the incident;
- making arrangements for a re-inspection of the incident at specified intervals or times (if the decision is taken to leave the incident ground).

1.3 WEIGHING THE BENEFITS OF IMMEDIATE ACTION AGAINST THE POTENTIAL RISK TO PERSONNEL

The assistance and advice of a specialist Wildfire Officer should be considered at an early stage and their attendance requested via the Regional Control Centre (RCC) as soon as possible. The specialist Wildfire Officer will assume the role of Tactical Advisor to the IC.

1.3.1 AS THE INCIDENT DEVELOPS

- adopt the **LACES** protocol:
  - **L**ookouts;
  - **A**wareness;
  - **C**ommunication System;
  - **E**scape Routes;
  - **S**afety Zone;
- brief crews on the safety procedures to be followed if surrounded by fire;
- ensure crews operate in minimum teams of 2;
- ensure regular rotation and relief of crews to prevent fatigue;
- monitor crews for signs of dehydration/heat exhaustion;

- appropriate Personal Protective Equipment (PPE) to be worn;

- anticipate the loss of daylight and ensure crews have torches;

- consider mobilisation of additional resources (eg, other agencies such as Forest Service of the Department of Agriculture and Rural Development (DARD), Maritime and Coastguard Agency (MCA), Mountain Rescue, Police Service of Northern Ireland (PSNI), etc).

1.3.2 PERSONNEL

Personnel may suffer from or be affected by:

- burns (including sun burn);
- smoke inhalation;
- reduced visibility/isolation/disorientation;
- being surrounded by fire;
- heat stress/exhaustion/dehydration/fatigue;
- slips, trips and falls (stumps, rocks, drains, bogs, wildlife burrows and fences);
- ankle injuries/foot blisters/insect bites and stings.

1.4 ALIGNMENT FACTORS AND WILDFIRE PREDICTION SYSTEM (WPS)

Wildfire is influenced by 3 major factors - *wind, slope* and *aspect* (aspect is whether or not the sun is shining on the fire and/or fuel). Wildfires are classified as Factor 0, Factor 1, Factor 2, or Factor 3 fires.

Factor 0

The fire has no factors of alignment in its favour, eg, a fire burning downhill, in a shaded valley with no wind, will be a slow moving fire.

Factor 1

The fire has one factor of alignment in its favour, eg, a fire burning uphill with no wind or sun.

Factor 2

The fire has 2 factors of alignment, eg, a fire burning uphill with the sun on it but no wind.

Factor 3

The fire has 3 factors of alignment, eg, the fire is burning uphill, with the sun on it and the wind is blowing in the same direction as the fire.

1.5 COMMUNICATIONS

- Communication plays an integral part in managing the safety of personnel at any incident; this is particularly true of wildfire incidents. All personnel on the incident ground should be fully briefed on risks, tactical mode in operation, and be made aware of the control measures that have been instigated to manage any identified risk. All teams should have the use of at least one hand-held radio.

- Where there are known issues with TETRA radio reception, early consideration should be given to asking for the assistance of MCA or the Mountain Rescue, who can sometimes provide assistance in this regard using VHF communications.

1.6 MARSHALLING OF VEHICLES

- Access for vehicles to rural/wildfires can be inherently difficult. Appliances not designed for off-road, such as WrLs, should be kept on hard-standing at all times. Most Forest Service roads are suitable for vehicles of up to 38 tonnes, and should prove suitable for NIFRS vehicles. Consideration should be given at an early stage to the setting up of a Marshalling Area and to a convenient and appropriate location for the Incident Control Point and eventually the Command Support Unit (CSU).

- Roads and forest/mountain tracks are potential escape routes and should be kept clear for this reason. The management and control of vehicle keys should be considered for these reasons also.

1.7 WELFARE

The IC should consider appointing a Welfare Officer to manage issues such as feeding, Rest Areas, First Aid Points, drinking water, relief crews, etc. Consideration should be given at an early stage to the mobilisation/ deployment of a Welfare Module. Welfare Modules are strategically located within NIFRS. It should also be noted that Fire and Emergency Support Service (FESS) may be mobilised to larger incidents. FESS can provide welcome support to NIFRS at large or prolonged incidents by assisting with feeding, comfort and rest facilities to fire crews.

2 – SECTION B

2.1 WILDFIRE INCIDENTS

It is essential that personnel appreciate the hazards that are associated with wildfires. It would be impractical to mention all the hazards that may be encountered, however, special consideration should be given to the following:

2.1.1 TOPOGRAPHY

- Topography refers to the features of the landscape such as hills, gullies, valleys, crags, etc. These features can alter fire behaviour by bringing the fire in and out of alignment. Firefighters must understand this concept so that they are able to apply tactics that are appropriate to the situation. Knowledge of how topographical features influence fire behaviour will also assist Firefighters in planning safe escape routes.

- Changes in topography can often affect fire behaviour and can act as trigger points where opportunity for changes to tactics should be considered.

2.1.2 SLOPE

- When a fire is burning upslope the flames are nearer to the fuel and therefore vegetation is subjected to a higher level of pre-heating. This, coupled with actual flame contact, accelerates fire-spread and increases fire intensity. A down-slope has the opposite effect and slows fire-spread and intensity as it moves out of alignment.

- A fire ignited on flat ground with no wind and with an even fuel load will burn in a circular pattern. If an upslope is introduced, the fire will spread uphill and develop a head.

2.1.3 ASPECT

Aspect refers to the direction a topographical feature faces, in particular, whether it is in or out of the sunlight. Solar pre-heating can dramatically alter fire behaviour and increase spread and intensity.

2.1.4 ALTITUDE

Increases in altitude will have an effect on the type of vegetation. There will also be a drop in temperature during the night, with an increase in humidity and moisture levels.

2.1.5 TOPOGRAPHICAL AFFECT ON THE WIND

Features on the landscape can affect the wind and how it behaves. The rougher the surface over which the wind is blowing, the more turbulence that will be created. Areas of high and low wind activity can be caused by features such as ridges and this should be borne in mind when assessing fire activity.

2.1.6 VALLEYS AND GULLIES

Steep valleys and gullies act in a similar way to a chimney and can accelerate fire-spread. Firefighters must take extreme care when working upslope of a fire in either of these topographical features.

2.2 WILDFIRE PREDICTION SYSTEM (WPS)

- WPS is a method that can be used to predict fire behaviour and assists operational personnel and planners alike. The system is based on the "alignment of forces concept".

- By recognising that wildfire is influenced by 3 major factors we can understand current fire behaviour and predict where the fire behaviour will be within or outside the threshold of control. The 3 alignment forces are wind, slope and aspect (in or out of the sun).

- The 3 forces of alignment, in conjunction with the presence of fuel, make up the wildfire triangle:

- Although fuel is not an alignment force it is a variable which supports fire development.

2.3 WIND

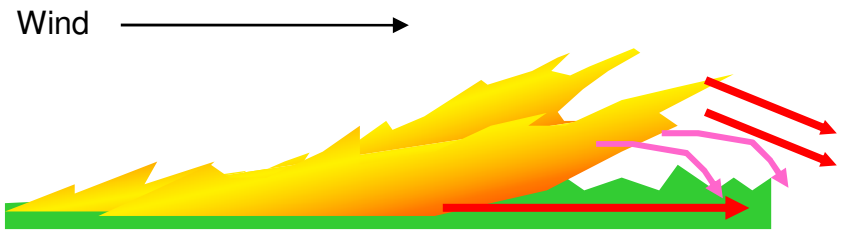
- The main driving force behind a wildfire is the wind direction and/or strength. A fire that starts on a calm day tends to draw wind inward from the sides as the convective column rises. A fire in this situation will attempt to expand outwards.

- If the direction of the wind changes, the fire will change direction and the efforts that have been made to contain the fire may be rendered useless. ICs should be aware that information on wind speed and direction may be available from NIFRS RCC, via the Met Office or FIREMET, or in some circumstances, via MCA.

- ICs should always be aware of the fire conditions in conjunction with weather conditions and time of day and should remember that large wildfires may in some cases create their own wind; this can cause erratic fire behaviour.

- Where a strong wind is present, the head of the flame will be driven forward closer to the fuel, causing pre-heating of fuel as a result of convection currents and radiated heat.

Wind Effect



2.4 SLOPE

- The slope of the ground may have a significant effect on the behaviour of the fire. Fire will gain or reduce speed when travelling up or down slope, increasing or decreasing the rate of fire-spread. It is often easier and more effective to allow a fire to continue to the top of a slope, allowing the pre-heating effect of the fuel to reduce.

- It is likely that when a fire has all 3 factors in its favour, fire behaviour will be maximised within the fuel type. The WPS is therefore an excellent tool and is a key element of any Fire Suppression Plan.

2.5 WILDFIRE BEHAVIOUR MODES

- Wildfire can be described as being in one of 3 behaviour modes:

  - **no alignment** - influenced by none of the forces;
  - **partial alignment** - influenced by some of the forces;
  - **full alignment** - influenced by all of the forces.

- Each alignment force acting in the fire's favour will increase the severity of the fire by a factor of 1, therefore the influence of wind, slope and aspect will each increase the severity by a value of +1.

- This principle gives us an alignment value which can be termed as **The Alignment Factors** - the number of factors which are working in favour of the fire.

- For reasons of simplicity, the fire behaviour can therefore be described as (**F** = Factor):

  - **F0** - when it has no fire alignment ;
  - **F1** - when it has 1 force in its favour;
  - **F2** - when it has 2 forces in its favour;
  - **F3** - when it has all 3 forces in its favour.

- At larger wildfire incidents the WPS can be used as a tool to manage risk and gather information on potential fire activity. ICs can use it to maintain effective situational awareness and set clear, safe and effective operational activities.

2.6 FUEL CHARACTERISTICS AND DESCRIPTION

- Fire is the combustion of a fuel in the presence of oxygen with heat required to start and maintain combustion. These 3 factors - heat, fuel and oxygen - are commonly referred to as the triangle of combustion. By removing any one of these factors, we can interrupt the combustion process.

- Wildfire fuel types are categorised as light, medium and heavy. This could be grass, heather and timber respectively. Each type of fuel has distinctive characteristics that require a different method of fire suppression.

2.7 GRASS

Dry grass burns readily and because of its lighter fuel loading, is strongly influenced by alignment with wind and slope; fire-spread can be rapid and is a significant risk. An important consideration when fighting fires in areas of grassland is the speed at which it can carry the fire into heavier fuel loading such as gorse or heather, leading to a rapid change in fire behaviour. As with other wildfire fuels, the length of grass is an important factor.

2.8 CROPS

Agricultural areas of grassland such as wheat or corn have a much higher fuel loading than natural grassland, this results in different fire behaviour. Crop fires are generally slower moving and burn with much more intensity. This type of fuel is strongly influenced by wind but is not normally located on steep slopes; it tends to be uniform with little change to its horizontal arrangements.

2.9 WOODLAND

Woodland can be clearly divided into 2 distinct types:

- naturally planted or regenerated woodland;
- commercial woodland/forest schemes.

Both types present different hazards to personnel. Great care and vigilance should be taken when dealing with incidents in or near woodland and forests.

2.9.1 NATURALLY PLANTED OR SELF REGENERATED WOODLAND

These areas consist of multiple species of naturally occurring hardwood trees and native plants. The most common tree species in this context includes:

- Oak;
- Beech;
- Birch;
- Sycamore;
- Ash.

These species of trees do not burn readily and require significant pre-heating.

2.9.2 COMMERCIAL FOREST SCHEMES

- These schemes generally consist of coniferous tree species and are intentionally planted for economic gain. In NI most of the commercial forests are owned and operated by Forest Service of DARD.

  Lead Officers from NIFRS and the Forest Service of DARD meet regularly under the existing Memorandum of Understanding to update and refine the annual Forest Service Fire Plan. Copies of the annually updated plan, which details Forest Service contacts, duty rotas and the locations of Forest Service resources, are held by Area and District Commands and also the RCC.

- Commercial schemes generally consist of the following types of native and European type species:

  - Scots Pine;
  - Corsican Pine;
  - Douglas Fir;
  - Larch (European and Japanese);
  - Spruce.

  Coniferous trees, with the exception of Larch, have a high resin content at all times of the year and can burn fiercely. Larch is much less flammable and can actually have a retarding influence on fire.

- The IC should liaise with Forestry Service personnel at the incident to establish the most critical area of forest to be protected. Advice from the Forest Service and experience would indicate that younger trees are most vulnerable to loss.

- In recent years the Forest Service has not been able to remove brash and undergrowth from harvested areas and it is common practice to replant saplings through this material. This can cause difficulty for fire-spread and makes it inherently difficult to fight fires in this material.

2.9.3 The main types of fires that occur in forests are:

- **crown fires** - when the fire travels from the tops of trees to adjoining trees;

- **torching fires** - when fire spreads rapidly from the bottom to the top of individual trees;

- **undergrowth fires** - the slow build-up of waste vegetation or the products of brashing;

- **underground fires** - may occur in the thick decayed vegetation on the forest floor. Fire may spread undetected for some time and distance;

- **ladder type fires** - growing vegetation forming a link between the ground and the upper portion of the tree.

2.10 MOOR, HEATHLAND AND PEAT BOGS

Many different plant species are present on moor, heathland and in peat bogs, with the most abundant in NI being grass, bracken, gorse and small shrubs such as heather. The horizontal arrangement of the vegetation plays an important part in fire development and fire behaviour. Some areas contain mixed vegetation while others have large uniform fuel.

2.10.1 BRACKEN

Bracken or fern is usually found growing tall and thick on poor quality land. Bracken is a hazard for a number of reasons and may be carcinogenic if the seed pods of the host plant are inhaled in large amounts. Dry bracken obviously presents a higher fire spreading hazard.

2.10.2 PEAT

- Peat is comprised of decomposing vegetation which has been decaying for hundreds of years and may extend to a depth of 12 m.

- Peat fires are generally initiated by a surface fire, eg, car, grass or rubbish. If the fire is not kept in check, downward spread into the peat layer may occur. Peat being fibrous entrains oxygen and will burn at great depth and intensity below ground. The unpredictability of the underground spread is a significant issue for firefighting operations.

2.10.3 MOORLAND

Moorland areas are large tracts of unenclosed areas of common land. Large areas of moorland in the Mournes, for example, are used for water catchments; the large quantities of peat providing initial filtration of rain water for the water supply. The after-effects of a major fire in these areas should be considered as it may result in substantial damage to the peat layer, including significant contaminated surface rainwater run-off, which can impact on the supply of clean water.

2.10.4 SCRUBLAND

- Scrubland is a classification of fuel type which is quite common across the British Isles, including urban areas. In NI it usually consists of mixed vegetation types, including grass, gorse, shrubs and small trees.

- Such areas are obviously of high risk as fire behaviour can be erratic with rapid changes to flame length and fire-spread. In some areas of scrubland a particular plant species is dominant, eg, large areas of gorse or bracken are common in NI.

2.11 WILDFIRE BEHAVIOUR AND STRUCTURE

A good understanding of fire behaviour is important so that accurate predictions on fire-spread and intensity can be made. It is important that all Firefighters have a good understanding of fire characteristics so that they can maintain a safe working environment.

PARTS OF A WILDFIRE

Head

The head is the part of the fire being influenced by the wind and/or slope. It is the fastest part of the fire and the area of greater flame height and intensity. It is also the area where most spotting can occur, therefore great care should be taken if working at the head of a fire.

Flanks

The flanks of the fire are slower moving and influence the intensity at the head. It should be noted that with a change in wind direction or slope, a flank can change its behaviour and suddenly become a fast moving head fire. This is a serious threat to personnel working the flanks. When possible the flanks should be attacked aggressively.

Tail

The tail is the slowest part of the fire as it is usually out of alignment and is back burning. The tail can be influenced by changes in topography or wind direction.

Spot Fires

Spot fires are normally found ahead of the main fire and are in most cases caused by either burning debris being blown forward into unburnt fuel or by concealed fire-spread in instances such as bogs.

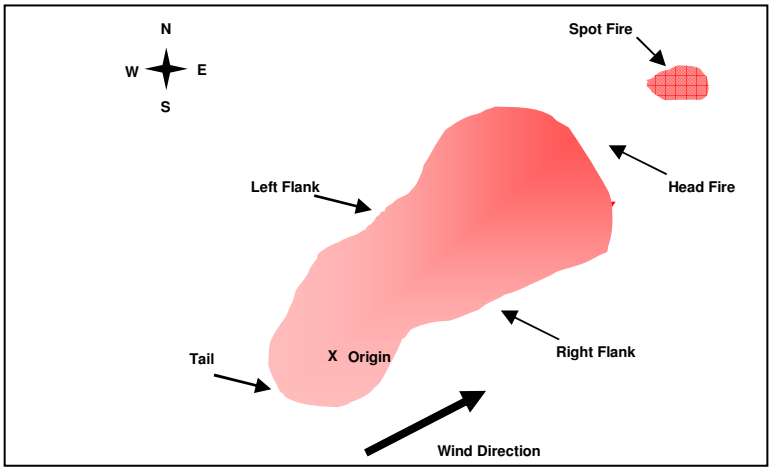


Figure 1 - Wildfire Footprint

2.12 TERMINOLOGY

2.12.1 FLAME HEIGHT

Flame height is the average height of the flames measured from ground level

2.12.2 FLAME ANGLE

The angle between the inclined flames and the ground in front of the fire is known as the flame angle. The height and the angle of the flame will affect the amount of heat radiating on the unburnt fuel ahead of the fire.

2.12.3 FLAMING ZONE

The Flaming Zone is the part of the fire which is actively burning.

2.12.4 FLAME DEPTH

The flame depth is the depth of the continuous Flaming Zone behind the front edge of the fire.

2.12.5 RATE OF SPREAD

The rate of spread is the amount of distance a fire travels over the ground. Rate of spread should be measured in metres per hour.

2.12.6 FIRE INTENSITY

Fire intensity is the amount of heat energy being radiated by the fire. This is affected by variations in height, type and quantity of fuel and the rate of spread. Operationally, the intensity of a fire can be measured using the flame height as a guide.

2.13 EXTREME FIRE BEHAVIOUR

- At any wildfire incident it is possible for the fire to adopt extreme behaviour and Firefighters should be aware that this can happen at incidents that appear to be low risk. This should be considered when carrying out DRAs.

- Extreme fire behaviour is indicated by:

  - very dark smoke;
  - surging or pulsing flames;
  - increase in spotting;
  - crowning.

  If fire behaviour is erratic or fast changing it is a sign of imminent danger.

2.14 THE LACES PROTOCOL

Lookouts

Awareness

Communication System

Escape Routes

Safety Zone

- LACES is a protocol that must be followed by all personnel on the incident ground. If the guidelines are followed then the safety of all personnel will be greatly increased. The LACES protocol ensures that, if a dangerous situation develops, a lookout can communicate a warning to the team. Once this warning is given, individuals will understand where they must go and what route they have to take. Personnel must be aware of the escape route and place of safety at all times.

- The LACES protocol should become as widely used in the wildfire context as "Stand and Run" is used within the structural fire context.

2.14.1 LOOKOUTS

- Lookouts must be appointed to ensure the safety of personnel deployed on the incident ground. Each team must have a lookout and where necessary further lookouts should be deployed in order to manage the safety of a number of teams.

- Resources permitting, it may be appropriate in some instances to deploy a Wildfire Officer as a lookout.

2.14.2 AWARENESS

- Awareness of risk includes an understanding of specific and generic hazards on the incident ground. All personnel should ensure that they understand their role in the Fire Suppression Plan and that they monitor their own and crews' safety at all times.

- It is essential that personnel appreciate the hazards that are associated with wildfires. It would be impractical to mention all the hazards that may be encountered, however, special consideration should be given to the following:

    - terrain;
    - smoke;
    - power lines;
    - military areas;
    - the effects of heat;
    - movement of vehicles;
    - animals/wildlife;
    - fuel types;
    - open water supplies as both an aid and a hazard;
    - light/darkness.

2.14.3 COMMUNICATION SYSTEM

- Communication is a key factor on the incident ground. It is the responsibility of everyone on an incident ground to ensure that all safety issues are communicated to relevant personnel. Supervisors must ensure that crews are effectively briefed and that their instructions are clear and understood by everyone.

- The maintenance of effective radio communications is also important. It is imperative that contact between the Incident Control Point and operational personnel is maintained. Teams operating on the fire-line must report any changes to the operational situation; likewise they must be informed of any changes in fire behaviour, tactics or planning.

- Radio communication should also be established with other agencies so that information can be exchanged. If helicopters are in use it is important to establish radio contact so that their operations can be directed from the ground. ICs must ensure that an effective communications system is used.

- The use of mobile phones may be utilised by specialist Wildfire Officers as a back-up to the TETRA radio system. In some instances, MCA or Mountain Rescue may provide assistance with communications.

2.14.4 ESCAPE ROUTES

- Escape routes are pre-planned routes that take personnel from a place of danger to an area of safety. Due to the dynamic fire behaviour at wildfire incidents, escape routes must be continually monitored and changed if necessary.

- Escape routes must be established at all wildfire incidents during the risk assessment and before commencing operations. Steep uphill slopes should be avoided as escape routes. When mobilising at wildfire incidents crews should avoid parking appliances directly on roads or pathways which are likely to be designated as escape routes.

2.14.5 SAFETY ZONE

- Safety Zones are places where personnel can congregate which are deemed to be free from the risk of fire. The width of the Safety Zone should be at least 1.5 times the height of the surrounding vegetation and large enough to accommodate everyone.

- Often at wildfire incidents the "black area" will be the designated Safety Zone. It is important in this instance that the Team Leader ensures that the vegetation within the black area has been fully burnt and not just surface burnt.

2.15 INCIDENT COMMAND SYSTEM (ICS)

- NIFRS ICS will be utilised at all incidents involving wildfires.

- The adoption of the standard NIFRS ICS not only builds upon and develops existing good practices but also reflects the need to ensure a safe system of work and accountability system for all personnel at all incidents.

- Additional control may be required at an incident where the incident is spread over a large area. The use of Forward Control Points at designated sites may assist the IC in the command and control of the incident.

- The attendance of the CSU on the incident ground will facilitate the provision of relevant, timely and accurate information. This may be critical in the successful management of the incident and ensures the health and safety of personnel and the most effective use of resources.

- The IC should, under normal circumstances, remain at the Incident Control Point, however it may be necessary for the IC to leave the Incident Control Point in order to assess the incident from time-to-time, but must remain in contact with the Incident Control Point and Command Support Team at all times.

SECTORISATION

- Due to the nature of wildfire incidents, sectorisation should take place at an early stage.

- At a wildfire incident it will be usual to delegate certain responsibilities to Sector Commanders. This will ensure that the appropriate level of control is maintained.

- The creation of sectors should be carried out on the instructions of the IC. Officers with appropriate skills should be appointed to command each sector and wildfire specialists should be used appropriately. At wildfire incidents a different approach to the style of sectorisation may be applied to that normally applied at a building on fire, etc. This may involve naming or numbering sectors differently to the standard ICS, but maintaining the underlying principles of that within the ICS.

- Sector Commanders should physically remain in the area of their command; they should provide direct and visible leadership. Sector Commanders must have a thorough briefing and understanding of the Fire Suppression Plan; they in turn must ensure that all personnel under their control are fully briefed.

2.16 SPECIALIST WILDFIRE GROUP (SWG)

- Not everyone at a wildfire incident, including the IC, can be trained to a specialist level.

- The SWG consists of a number of officers from Station Commander to Group Commander role. This group of officers is known as Wildfire Officers (WFOs).

- The formation of the SWG is an important development. When mobilised, members of this group will provide specialist advice to ICs. On occasion it may be appropriate for teams of WFOs to be deployed at larger wildfire incidents to evaluate and attack the fire, using both direct and indirect methods, (further training and policy change permitting).

- Wildfire specialists have received specialist training at national level, and have a high level of understanding of fire behaviour, fire-spread, fuel types, suppression techniques and operational procedures. They will use this knowledge to improve operational effectiveness and safety.

2.16.1 MOBILISATION OF WFOs

- WFOs should be mobilised to attend wildfire incidents under the following circumstances:

  - if the incident is attended by 4 or more appliances;

  - if RCC personnel deem that the attendance of a WFO is appropriate (this, for example, may be as a result of information received at the time of call);

  - if the IC of an incident that has less than 4 appliances in attendance requests the mobilisation of a WFO.

- Where WFOs are mobilised to incidents that have 4 or more appliances in attendance then, resources permitting, a minimum of 2 WFOs should be sent.

2.16.2 THE ROLE OF THE WFO

- The primary function of the WFO is to provide specialist tactical support to the IC. WFOs will assist the IC in formulating a Fire Suppression Plan which will be effective and safe.

- WFOs at a wildfire incident will assist the IC with assessment of the following factors:

  - expected fire-spread;
  - fire behaviour and severity;
  - environmental and economic impact;
  - Fire Suppression Plan;
  - resource requirements;
  - time of day and weather;
  - critical points;
  - safety issues.

2.16.3 FIRE SUPPRESSION PLAN

- Once wildfire specialists have identified likely fire-spread, fire behaviour and severity, and carried out an impact assessment, they will be in a position to assist the IC to formulate a Fire Suppression Plan.

- WFOs have been issued with a full suite of ordnance survey maps for NI. A map of the area should be used and this should be marked with any useful information which might include the following:

  - fire-spread;
  - fire alignment factors (F0, F1, F2, and F3);
  - actual and predicted fire footprint;
  - areas of high value;
  - areas of operational significance such as "critical points" or "windows of opportunity";
  - rendezvous and feeding points;
  - command areas such as main and forward control points;
  - allocated resources;
  - anchor points;
  - safe areas;
  - sectors;
  - holding areas;
  - suitable roads and tracks;
  - helicopter landing areas;
  - open water locations.

- Where a helicopter is available it may be beneficial for a WFO to take an aerial overview of the incident; this will assist in obtaining important information that cannot be obtained from the ground.

2.16.4 DOCUMENTATION

At larger incidents the plan should be written down so that it can be understood by everyone in the Command Team and to enable relevant information to be passed on to sectors, teams and individuals. WFOs, on arrival, will complete the necessary Wildfire Risk Assessment pro forma shown at Appendix "1".

2.16.5 SAFETY

- The main purpose of the SWG is to ensure that wildfires are dealt with safely. The specialist skills and knowledge of WFOs will increase the health and safety of all personnel on the incident ground. In line with NIFRS mobilising procedure, a Safety Officer will also be mobilised as per the mobilising grid.

- In certain situations WFOs may be appointed as Team Leaders. This is advantageous if a team requires closer supervision and control; an example of this might be if the head of a fire is attacked or if firefighting operations commence or continue during the hours of darkness.

2.16.6 WILDFIRE SPECIALIST TEAMS

- Resources permitting, teams consisting of wildfire specialists may be deployed at wildfire incidents. These teams may perform any number of roles at a fire, which include:

  - observation of fire behaviour and spread;
  - reconnaissance;
  - identify windows of opportunity;
  - defend critical points;
  - firefighting operations, including direct and indirect; tactics.

- SWG Teams will consist of between 2 - 6 members, depending on their role. Observation and Reconnaissance Teams will normally consist of 2 members while a Firefighting Team should consist of a minimum of 4 persons.

- SWG Teams may be expected to operate on the incident ground for lengthy periods and will take equipment and provisions necessary for the team to carry out its function.

- Additional training permitting, it is envisaged that these teams will have additional specialist skills, including a capability to "fight fire with fire".

- These tactics may in future be used by specialists to create back burns to limit fire-spread or to defend critical points. The fire may also be suppressed by lighting secondary fires that will be drawn into the main fire; this has the effect of lowering fuel loads and intensity.

- Consideration should also be given to mobilisation of the Specialist Rescue Team (SRT). SRT personnel have been trained to an advanced level in compatible competencies such as grid search and navigation. These resources may be useful to assist with navigation or as an additional control measure for Firefighter safety.

- **Under <u>no circumstances</u> is offensive or back burning to take place unless on the instructions of the IC and only then under the direct supervision of a WFO.**

2.17 TACTICAL CONSIDERATIONS

INITIAL ATTACK

In the early stages of fires and subject to a DRA, it is accepted that ICs may adopt offensive or aggressive firefighting tactics, with crews utilising either beaters or water-based firefighting media. The objective is to attempt to stop the spread of fire in the initial stages of the incident, thereby reducing the risk of the incident becoming out of control. However, ICs should not commit their resources until they understand what potential the fire has and how it will develop. As soon as possible a comprehensive risk assessment should be completed. The risk assessment should include the following analysis:

- information on the current fire situation, including rate of spread, fire behaviour and severity;
- understanding of the fire's potential future development;
- access/egress (safe routes);
- fuels;
- identification of critical points;
- location of windows of opportunity;
- terrain – including slope/aspect;
- weather information;
- control measures required;
- resource requirement;
- specific risk identification.

2.18 WILDFIRE SUPPRESSION TECHNIQUES

- Wildfire suppression techniques are the various methods which can be used to suppress a wildfire but all must be carried out with safety as the first priority. It is imperative that whatever tactic is used, everyone on the incident ground is aware of the plan and all personnel have an identified escape route to a place of safety.

- The purpose of fire suppression is to extinguish the fire; this can be best achieved by establishing a line from which firefighting operations can be carried out.

- There are various methods by which suppression can be achieved, including direct and indirect attack.

- Types of attack include applying water, foam and other retardants, beating out the fire, or establishing a control line by removing all vegetation available to the fire.

- Combinations of these methods may be employed at a wildfire, depending which is most appropriate to a given situation.

2.18.1 DIRECT ATTACK

Direct attack is where the fire is attacked by firefighting at the fire perimeter by teams using water lines, beaters and hand tools.

2.18.2 INDIRECT ATTACK

- Indirect attack is when firefighting operations are carried out away from the line perimeter; it is a method used to suppress wildfire; it can be used both offensively and defensively.

- Offensive burns are those which are launched directly at the fire and which are intended to move towards the approaching fire-front.

- Defensive burns are those which are used to create a burnt area before the arrival of a fire-front and so starve the fire of available fuel.

- Indirect methods are appropriate when fire intensity is high and flame length is above 3 meters. This type of operation should only be carried out by specialist officers.

2.18.3 PARALLEL ATTACK

- This method involves building a control line parallel to the fire's edge, far enough away from the fire to allow crews to work out of the heat and smoke.

- Parallel attack operations should be monitored closely and only performed under supervision of wildfire specialists.

- Control lines can be constructed either by hand or by the use of machinery, such as a digger, plough or swipe/brush cutter. Forest Service or other agency machinery may be made available by arrangement at certain locations to assist with this process.

2.18.4 SUPPRESSION STRATEGIES

- Due to the nature and size of some incidents it may be necessary to employ several techniques in order to bring the fire under control. It is important to appreciate that wildfire is dynamic and its behaviour will change.

- It is imperative that all personnel are aware that these changes can mean an increase in fire severity and speed of fire travel. Understanding when and where changes occur will not only allow Operational Plans to be put into effect but will also improve the safety of everyone on the incident ground.

- Fire suppression strategies must be based on understanding. Consideration should be given to:

  - the predicted fire behaviour;
  - where changes will occur;
  - the suppression tactics to be used;
  - available resources.

- Having considered these factors it is necessary to identify when and where a Fire Suppression Plan will be successful (window of opportunity). Timing is crucial, as any attack must be within the capabilities of available resources.

- To commit at the wrong time or with insufficient resources will lead to failure. It is often necessary to wait for fire behaviour to change, or until more resources have become available. If this situation arises, it is necessary to restrict the fire and this is usually achieved by pinching the fire.

2.18.5 PINCHING

Pinching is a tactic where the flanks of a fire are attacked. The purpose of pinching is to prevent the fire-front from widening and to lower the intensity of the head. Pinching is a useful strategy when planners are waiting for the severity of the head fire to lower. Direct and indirect tactics can be used to pinch the flanks. When working on the flanks it is important that team and sector lookouts are aware that a change in wind direction may result in a flank fire becoming a head fire.

3 – SECTION C

3.1 HISTORY OF WILDFIRE INCIDENTS

- Wildland fire may be defined as any unwanted fire involving outdoor vegetation. While it is often thought of as occurring in forests, open moorland, crop fields and gorse, it may also occur in areas such as motorway medians, parks and golf courses. In addition, with residential development spreading into once rural areas, a relatively new phenomenon has been created – the wildland/urban interface. This phenomenon, more prevalent in the United States of America and Southern Europe, has changed the nature of the wildland fire problem in some very significant ways. Both the life hazard and the potential economic losses in wildland areas have increased greatly. The increase in human activity in rural areas has multiplied the number and variety of sources of ignition.

- Another aspect is that Firefighters are primarily trained in structural firefighting. Many Firefighters across the globe are killed or injured each year because they lack the training and expertise necessary for them to know how wildfires are affected by difference in fuels, weather and topography. NIFRS intends to train Firefighters to know how to safely fight these fires and to recognise when they are in a life-threatening situation before it is too late. The wildfire strategy and this SOP will go some distance to achieve this outcome.

3.2 WILDFIRES AND FARMERS

- In NI, particularly from February onwards, it is common practice that farmers and landowners will intentionally set fire to large areas of mountainside. This is done for several reasons, namely to encourage new grazing, to clear scrubland or to remove ground cover for animals such as foxes prior to the lambing season.

- It is debatable whether this activity is legal, and in this regard several pieces of environmental and other legislation such as legislation regarding burning near to forests may be relevant.

- Experience has taught us that even where we can identify those responsible, PSNI or other enforcing agencies find it difficult to enforce relevant legislation.

- It is important for NIFRS personnel to bear in mind their statutory powers in relation to fire and its extinguishment if it is reasonably believed it to be out of control or to endanger property or lives.

- Article 18 of "The Fire and Rescue Services (Northern Ireland) Order 2006" states;

  "A fire and rescue officer being on duty, may do anything he reasonably believes to be necessary if he reasonably believes a fire to have broken out or to be about to break out, for the purpose of extinguishing or preventing the fire or protecting life or property."

- Article 18 also states:

  "In particular, a fire and rescue officer may enter premises (includes property), by force if necessary, without the consent of the owner or occupier of the premises."

3.3 PREVENTION AND PARTNERSHIP

- The best approach for NIFRS would be to avoid wildfires starting in the first instance. Experience in other fire categories such as dwelling fires, statistics and experience shows we can achieve more by working with strategic partners to drive down the risk of fire occurring at all – wildfire is no different.

- Notable practice is already under way with partnerships such as "The Safer Mournes Partnership" and other similar initiatives where NIFRS work with stakeholders such as farming, heritage, law enforcement, environmental, tourism and other interests to drive instances of wildfire down.

3.4 REFERENCE MATERIALS

- Service Training Note - Operational 12 - *Wildfire Operational Safety*;

- Memorandum of Understanding between Northern Ireland Fire & Rescue Service and Forest Service of the Department of Agriculture and Rural Development relating to *Forest Service Incidents*;

- Occupational Health, Safety & Welfare (OHSW) Bulletin No 8/2007 - *Safe Operations at Wildfire Incidents*;

- OHSW Bulletin No 18/2007 - *Persons Reported at Wildfire Incidents*;

- Chief's Circular No 10/2009 - *Deployment of Wildfire Officers*;

- NIFRS Operational Aide-Mémoire - *Wildfire Incidents*;

- SOP No 23 – *Tasking and Operational use of Helicopters*;

- Integrated Risk Management Plan Steering Group Risk Management Planning Policy Guidance – *Wildfire*;

- International Fire Service Training Association – *Wildland Firefighting for Structural Firefighters (Fourth Edition)*.

CONCLUSION

NIFRS has developed these procedures after wide consultation, and the consideration of best practice amongst UK Fire & Rescue Services. The tactics available, coupled with the knowledge, experience and ongoing training of the specialist WFOs within NIFRS, are intended to increase the safety of operational personnel and the public, as a result of wildfire incidents, and to mitigate the potential environmental impact.

NIFRS organisation-wide issue of dedicated wildfire PPE, coupled with the continual evaluation of new equipment and indirect firefighting techniques, will continue to positively influence future development of tactics and safe systems of work.

This SOP now constitutes NIFRS Training Note.

Area Commander (Southern Area Command)

DR/RS

6 May 2011

WILDFIRE GLOSSARY OF TERMS

Anchor Point:	A strong point from which a control line can be constructed.
Aspect:	Direction a slope faces in relation to the sun.
Back Burn:	An area of vegetation that is burned deliberately to create a black area free of fuel combustibles.
Black Area:	An area that has been burnt by fire.
Control Line:	A natural or constructed barrier which prevents fire-spread.
Command:	The authority to direct the actions of resources at a wildfire incident.
Command Support:	Command Support is the role undertaken by one or more officers at an incident. The role includes recording, liaison, resource management and information gathering. At a larger incident these roles may be undertaken by a team of officers tasked with managing sectors.
Contained:	Where the spread of fire is halted.
Controlled:	The point at which the fire is contained within its perimeter and no break-out is expected
Critical Point:	An area of topography that will have a critical effect on the development of the fire.
Crown:	The upper area of foliage at the top of a tree.
Crowning:	When a fire burns freely in the upper foliage and moves from tree-to-tree, sometimes without the support of a ground fire.
Direct Attack:	An offensive fire suppression tactic which involves an attack being made at or near to the fire's edge.
Escape Route:	A pre-planned route for Fire Teams to move to a place of safety.
Extreme Fire Behaviour:	A level of fire activity that prevents the fire from being suppressed using direct methods. Fire behaviour is difficult to predict as in this state the fire can influence its own pattern of development.

Fire Behaviour:	The manner in which the fire interacts with fire variables.
Fire Break:	A natural or constructed fire barrier.
Fire Perimeter:	The entire outer edge of the fire.
Fire Suppression:	The activities involved in extinguishing wildfires.
Fire Suppression Plan:	Operational Plan identifying tactics and resources required to safely manage a wildfire incident.
Flame Angle:	The angle between the inclined flames and the ground in front of the fire.
Flame Height:	The vertical distance between the ground and the tip of the flames.
Flame Length:	The total length of the flame produced by the fire.
Fuel:	Any material, normally vegetation, that once ignited, sustains fire activity.
Fuel Loading:	The amount of fuel available to burn.
Fire Line:	The burning perimeter of the fire.
Head:	The most intense part of a wildfire, normally located at the front part of the fire.
Incident Command System	The system selected by the IC to manage organisational, command and risk issues at a wildfire.
Incident Commander:	The officer in charge of the incident, having overall responsibility for selecting appropriate management systems.
Indirect Attack:	This is a suppression tactic that does not involve attacking the fire with water and hand tools at the fire edge. It usually involves operational activities such as back burning or the construction of control lines some distance from the fire.
LACES:	Wildfire safety system to be used at all incidents.
Parallel Attack:	This is a suppression technique where firefighting operations run parallel with the fire. This technique is employed to limit the lateral spread of the fire by constructing fire lines near to the fire edge. This method can be used to pinch both flanks and encircle the fire.

Pinching:	Attacking the fire from both flanks working from the tail towards the head.
Rate of Spread:	This normally refers to the speed of the fire as it burns through vegetation.
Resources:	All personnel and equipment available to meet incident requirements.
Safe Systems of Work:	Safe working practises that limit exposure to identified hazards within an acceptable level.
Safety:	A state where the exposure to risk has been controlled to an acceptable level.
Safety Officer:	An officer who is given responsibility to manage areas of risk.
Safety Zone:	An area clear of flammable materials used as a retreat for personnel and equipment.
Sector:	An area of responsibility delegated to a Sector Commander. Sectors can be initiated to be either operational or support activities.
Sector Commander:	An officer tasked with responsibility for tactical and safety management of a clearly identified part of an incident.
Specialist Wildfire Group: (SWG)	A team of trained Wildfire Officers.
Spotting:	Fires started by airborne sparks and embers projected ahead of the main fire.
Strategy:	Plans formulated by the IC that will meet the requirements of the incident.
Tactics:	The manner in which operational resources are deployed to meet the requirements of the Strategic Plan.
Tail:	The rear or trailing part of a wildfire which burns against the wind or slope.
Topography:	Geographical features of terrain.
Wildfire:	A generic term used to describe an uncontrolled rural fire in various vegetation types.
Windows of Opportunity:	An area which will allow suppression methods.

APPENDIX "1"

NORTHERN IRELAND FIRE AND RESCUE SERVICE

WILDFIRE RISK ASSESSMENT

Location	Date	Incident Number

Land Owner	Assessment Officers

Section 1 - Vegetation Types

Heather ☐ Grass ☐ Woodland ☐ Shrub ☐

Uniform Fuels ☐ Patchy Fuels ☐ Other ☐

Section 2 - Assessment of Risk

☐ Identified Hazards Include

☑ Appropriate Hazards

Hazards should be listed below and control measures must be outlined

1	☐ Fuel Types	6	☐ Environmental	11	☐ Speed of spread
2	☐ Fuel Arrangement	7	☐ Anchor Points	12	☐ Likely Fire Alignment
3	☐ RH Reading	8	☐ Control Lines	13	☐ Extreme Fire Indicators
4	☐ Wind Strength/direction	9	☐ Likely Fire Intensity	14	☐ Available Personnel
5	☐ Slope	10	☐ Communications	15	☐ Night Time Working

Section 3 - Actions

☐ Required Actions Include

☐ Complete Documentation	☐ Issue Maps/compasses etc.	☐ Weather Forecast
☐ Appoint Management Team	☐ Establish Communications	☐ Carry Out Test Burn
☐ Examine SID's	☐ Adopt LACES Protocol	☐ Allocate Resources
☐ Issue Team Briefs	☐ Emergency Procedures	☐ Map Incident Area
☐ Brief Personnel	☐ Appoint Lookout (s)	

Section 4 - Team Safety

☐ Instigate LACES ☐ Appoint Appropriate Lookouts ☐ Establish Communications ☐ SWG Support

☐ Additional Safety Considerations

LACES	Vehicle Parking	Equipment Support
PPE	Communications	Welfare
Team Work	Competencies	Other Agencies
Place of Work	Briefings	Emergency Procedures
Safe Route	Team Numbers	Task

Section 5 - Information

	RH Reading	Time
☐ Introductions to colleagues carrying out different roles	☐	☐
☐ Confirm initial job tasks and overall plan	☐	☐
☐ Confirm performance expectations and standards	☐	☐
☐ Update weather information. RH readings to be taken every 20 minutes	☐	☐
☐ Review plan and communicate changes	☐	☐
☐ Inform lookouts and relevant officers of developments and plan changes	☐	☐

Section 6 Communications

☐ Radio and Other Communication ☐ Channel Allocation ☐ Confirm Verbal Instructions ☐ Complete and Issue Documents

Agencies that may be able to assist in establishing communications at a wildfire incident include

☐ RAF *VHF* ☐ Police ☐ Mountain Rescue *Repeater Vehicles*

Hazards Identified	Control Measures

APPENDIX "2"

NOTES ON THE COMPLETION OF WILDFIRE RISK ASSESSMENT FORM

The Wildfire Risk Assessment form is designed to highlight the main risks encountered at a wildfire and list the control measures to be taken to address them. Wildfire is dynamic and there may be particular hazards which are not included in the form but control measures should also be included in the box at the bottom of the pro forma.

The ICS will ensure that appropriate management control is established at an early stage.

The form should be followed to assist officers in formulating a safe and effective plan.

SECTION 1 – VEGETATION TYPES

Vegetation is the fuel involved or likely to become involved in a fire; the amount and its arrangement will have a dramatic effect on fire behaviour. If officers have an understanding of the fuel types and fuel loading they will be able to predict likely fire intensity. All headings relevant to the incident should be ***ticked.***

SECTION 2 – ASSESSMENT OF RISK

The risks listed in this section are risks that will be common at wildfire incidents. All risks which are appropriate to the incident must be ***ticked*** and control measures established. The instigation of relevant control measures may be established by following normal wildfire procedures and safety protocols. For instance, the appointment of an incident or sector lookout following the LACES safety protocol and by establishing an effective ICS will address most risks encountered at a wildfire incident.

SECTION 3 – ACTIONS

Appropriate actions to be taken at all wildfire incidents are listed. All actions which are appropriate to the incident must be ***ticked*** and any actions identified must be acted upon. The task identification process will assist officers to carry out essential measures which will improve management of the incident.

SECTON 4 – TEAM SAFETY

The Wildfire Risk Assessment form is concerned with safety but Section 4 highlights safety issues that are common at all wildfire incidents and should be considered at every incident. The top headings should be ticked to confirm these actions have been taken. The lower headings are for consideration when deploying a team on the incident ground. The relevant box should be ***ticked*** to indicate that these factors will be considered when teams are deployed.

SECTION 5 – INFORMATION

Briefing individuals and teams plays an important role in addressing safety issues at a wildfire incident. The appropriate boxes should be ***ticked*** to indicate that these briefings have been carried out.

Relative Humidity (RH) readings should be taken every 20 minutes and these should be recorded on the RH reading sheet and transferred onto the Wildfire Risk Analysis form at appropriate times (normally every hour).

SECTION 6 – COMMUNICATIONS

The communication and recording of relevant information at a wildfire incident is essential; if these communication systems are not established and maintained the safety of personnel may be compromised. It is important that effective radio communications allow information to be passed within the ICS. The relevant box should be ***ticked*** to indicate that communication has been considered.