



## Water enhancer operational pilot 2013/14

### Purpose

This briefing outlines arrangements and relevant information for a water enhancer operational pilot led by the State Aircraft Unit (SAU) on behalf of Victorian fire agencies, in south west Victoria over the 2013/14 fire season. The purpose of this brief is to inform fire agency personnel of:

- the scope of the water enhancer operational pilot
- responsibilities for the water enhancer operational pilot
- procedures for the water enhancer operational pilot
- guidelines for use of water enhancers.

### Scope

Water enhancers will be piloted in aerial fire suppression operations during the 2013/14 fire season in the Barwon South West and Grampians Regions. This brief is relevant to all fire agency personnel involved in aerial fire suppression operations conducted within these two regions between January and March 2014.

### Water enhancer operational pilot background

Water enhancer polymers (sometimes referred to as gels) are polyacrylamide fire chemical additives used to extend the suppression effect of water applied in fighting bushfires, grassfires and structure fires.

The purpose of the operational pilot is to learn about the effectiveness and handling of different water enhancer products in an operational environment. This information will assist decisions

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about the ongoing use of water enhancers in aerial fire suppression operations, and development of product standard requirements, training and procedures. The operational pilot will collect performance data on up to six water enhancer products under live fire conditions.

The operational pilot will run from the Colac and Stawell airbases between January and March 2014. Water enhancers will only be deployed from HT347 at Colac, and primarily from Bom351 and Bom360 at Stawell. Water enhancers will be used in routine fire suppression operations across all land tenures and fuel types under a limited range of conditions and within a defined footprint.

On readiness level 3 (very high fire danger) days, water enhancers will be available for firebombing deployment from rotary and fixed wing aircraft in accordance with a schedule managed by the SAU. Water enhancers are only to be used within the boundaries of the Barwon South West and Grampians Regions. Only one type of water enhancer will be used at any one time according to the SAU project schedule.

When firebombing missions use water enhancers, relevant personnel will be asked to complete a simple data collection form and return it to the SAU at the end of each day. In Autumn 2014 this information will be analysed and reported on as part of the overall project evaluation.

Mixing and loading will be provided by the water enhancer product supplier at Stawell. Product concentrate will be loaded into HT347 at Colac by the aircraft contractor. HT347 will have both foam and water enhancer capability for the duration of the operational pilot, which it can deploy throughout the Barwon South West and Grampians Regions.



## Responsibilities

SAU and fire agency personnel responsibilities for the water enhancer pilot are as follows.

<p>State Aircraft Unit</p>	<p>Planning</p> <ul style="list-style-type: none"> <li>• obtains consent from aircraft contractors to use and ready their aircraft for the operational pilot</li> <li>• selects and procures water enhancer products to evaluate</li> <li>• coordinates project communications and liaison</li> <li>• provides forms, briefings, instructions and information on the use of water enhancers during the operational pilot</li> </ul> <p>Implementation</p> <ul style="list-style-type: none"> <li>• monitors readiness days and liaises with relevant Regional Controllers, Agency Duty Officers and Aircraft Officers to identify water enhancer information collection days and any opportunities for more detailed information gathering</li> <li>• informs State Air Desk of days when water enhancer information collection is planned</li> <li>• arranges product delivery to airbase</li> <li>• arranges storage facilities for water enhancer as needed</li> <li>• provides accredited and functioning fully self-sufficient mix / loading crews and equipment for fixed wing aircraft as needed.</li> <li>• provides Airbase Managers for water enhancer mix / loading operations as agreed with relevant District.</li> <li>• liaises with Agency Duty Officers to ensure chemicals, MSDSs and procedures are in place, opportunities to use water enhancers are identified and to coordinate data collection by airbase, fireground and aircraft staff</li> <li>• liaises with Aircraft Officers (or delegate) to ensure airbase arrangements for mixing and loading are in place and opportunities to use water enhancers are identified</li> <li>• liaises with agency personnel as necessary (in consultation with the Incident Controller) to follow up information gaps and emerging issues</li> </ul> <p>Communication</p> <ul style="list-style-type: none"> <li>• provides updates to fire agency personnel and others as relevant during the project</li> <li>• manages stakeholder communication</li> <li>• prepares evaluation documentation</li> </ul>
<p>State Airdesk</p>	<p>Deploys aircraft with water enhancer on board on agency request</p>
<p>Regional Controllers</p>	<p>Implementation</p> <ul style="list-style-type: none"> <li>• liaises with SAU project team to identify water enhancer information collection days</li> <li>• informs relevant Agency Duty Officers of arrangements for water enhancer information collection</li> <li>• informs Incident Controller of requirements for water enhancer information collection</li> </ul>
<p>Agency Duty</p>	<ul style="list-style-type: none"> <li>• liaises with SAU project team and Regional Controller about arrangements for</li> </ul>



<p>Officers</p>	<p>water enhancer information collection</p> <ul style="list-style-type: none"> <li>• informs Aircraft Officer / Airbase Manager, Operations Officers and Air Attack Supervisors and aircraft contractors of days when water enhancer information collection is scheduled</li> </ul> <p>If no IMT in place</p> <ul style="list-style-type: none"> <li>• determines when water enhancer product will be used and informs State Airdesk through standard communications protocols</li> <li>• arranges for relevant fire ground personnel to complete Ground operations (attachment 1) and Air operations (attachment 2) data collection forms respectively and return them to SAU as per details on the form</li> <li>• participates in follow up liaison regarding information gaps and emerging issues</li> </ul>
<p>Incident Controller (once IMT activated)</p>	<ul style="list-style-type: none"> <li>• informs the incident when water enhancer will be used and information collection is required as part of their mission through the Incident Action Plan</li> </ul>
<p>Aircraft Officer responsible for HTK347, or operations at Stawell airbase (once IMT activated)</p>	<p>Implementation</p> <ul style="list-style-type: none"> <li>• liaises with relevant Operations Officer, airbase staff and SAU project team to ensure product availability, mixing and loading arrangements are in place for information collection days</li> </ul>
<p>Airbase Manager responsible for HTK347, or operations at Stawell airbase</p>	<p>Implementation</p> <ul style="list-style-type: none"> <li>• includes water enhancer information in briefings on days when information collection occurs</li> <li>• manages mixing, loading, deployment, incidents and cleanup of aircraft as per SAUPs and variations in this brief</li> <li>• completes Air base data collection forms (attachment 3) and returns them to SAU as per details on the form</li> <li>• participates in follow up liaison regarding information gaps and emerging issues</li> </ul>
<p>Operations Officer * see note below</p>	<p>Implementation</p> <ul style="list-style-type: none"> <li>• determines when water enhancer product will be used in consultation with Air Attack Supervisor</li> <li>• arranges for relevant fire ground personnel to complete Ground operations data collection forms (attachment 1) and return them to SAU as per details on the form</li> <li>• participates in follow up liaison regarding information gaps and emerging issues</li> </ul>
<p>Air Attack Supervisor</p>	<p>Implementation</p> <ul style="list-style-type: none"> <li>• assists Operations Officer to determine when water enhancer product will be used</li> <li>• completes Air operations data collection forms (attachment 2) and returns them to SAU as per details on the form</li> <li>• participates in follow up liaison regarding information gaps and emerging issues</li> </ul>

\*Operations Officer means the Incident Controller, Divisional Commander or senior DEPI Operations Officer if IMT not activated, and the IMT Operations Officer once an IMT is activated



## Procedures

Standard State Aircraft Unit Procedures (SAUPs) will be applied during the water enhancer evaluation project in addition to the following procedures.

Where foam and retardant are referred to in the SAUPs listed below, these procedures also apply to the use of water enhancers for the water enhancer evaluation project:

- State Aircraft Unit Procedure EQ 5.02 Personal Protective Equipment . Aviation Operations
- SAUP GO 3.01 Airbase Operations
- SAUP GO 3.03 Foam / water enhancer / retardant handling and mixing operations
- SAUP SO 4.07 Firebombing Operations.

For firebombing operations during the operational pilot, environmental precautions applicable to retardants must be applied for water enhancers. In particular avoid use in water supply catchments and around environmentally sensitive sites such as organic farms.

Water enhancers must only be used within the boundaries of the Barwon South West and Grampians Regions.

Water enhancers must only be used on Readiness Level 3 (Very High Fire Danger) days, unless otherwise authorised by the relevant Regional Controller

Water enhancers must only be used when made available for the operational pilot, unless otherwise authorised by the State Controller

Fire agency personnel will not mix water enhancers for the operational pilot, unless authorised by the Regional Controller

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Water enhancer products must only be used in accordance with the qualified application and relevant mix ratios specified in the Qualified Product List (see attachment 4).

Water enhancers are appropriate for use in direct and parallel attack.

Water enhancer and retardant must not be deployed together in situations where their application may overlap.

For the operational pilot, water enhancers must not be mixed in equipment with residues of other aerial suppressants, other water enhancer products or retardants.

An approved hygiene strategy relevant to the water enhancer must be followed when switching between product types in an aircraft.

Wash down and spills clean-up must follow the manufacturer's recommendations provided for the individual product type.

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## Guidelines for use of water enhancers

Water enhancers are fire suppressants used to extinguish flames and delay recombustion of fuels for a short period. They have a gel like consistency which wets, cools and insulates fuels. The insulation effect remains effective until the water held within the chemical mixture evaporates. The period of effectiveness varies with conditions.

To enable the operational pilot to collect sufficient data, water enhancers should be used in place of water and Class A foam in accordance with the guidelines below where approved by the Regional Controller.

### Strategy

Water enhancers are primarily used in support of ground resources during direct attack operations.

They may also be suitable for use in parallel attack operations. The table below provides a comparison of the suitability of water enhancers versus existing suppressants and retardants for use in different suppression strategies.

Strategy	Water	Foam	Water enhancer	Retardant
Indirect Attack	0	0	0	3
Direct Attack	3	3	3*	3
Parallel Attack	1	1	2*	3

0. Not recommended, 1 . Marginal, 2 . Suitable, 3 . Effective

\*suitable where ground resources are readily available.

Water enhancer is not suitable for situations where:

- a long term retardant effect is required
- aircraft loaded with retardant are deployed to the same fire sector.

## Compatibility with other products and salty water

Salts in both water supply and fire retardant chemicals can compromise the performance of water enhancers. Water enhancer drops may also wash off previously applied retardant. The effects of water enhancers and retardants on each other may reduce the effectiveness of the drops and safety. Water enhancer and retardant must not be deployed together in situations where their application may overlap.

Mix ratios of water enhancers may need to be adjusted in conditions where there are relatively high salt concentrations within water supplies.

Water enhancers must not be mixed with other aerial suppressants, other water enhancer products or retardants as they may reduce the effectiveness of the drop. An appropriate hygiene strategy provided by the relevant water enhancer supplier must be followed when switching between product types.

### Washdown and spills clean up

Due to the nature of water enhancer products, all mixing equipment and aircraft require wash down / flush at the end of water enhancer operations to prevent equipment blockages or malfunctions. Wash down and spills clean-up must follow the manufacturer's recommendations.

### Applications

Victorian fire agencies use the USDA Forest Service Qualified Product List to determine the types aircraft fire chemicals may be used in. The testing process associated with the Qualified Product List considers the corrosion effects of the products and impacts on aircraft safety. Water enhancer products must only be used in accordance with the qualified application and relevant mix ratios specified in the Qualified Product List (see attachment 4).





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### **Drop cloud characteristics**

The following drop cloud characteristics are based on observations during controlled drop testing.

- in comparison to other aerial suppressants, correctly mixed water enhancer drops evacuate from aircraft slower, with reduced stripping and shearing. They are less affected by head and cross winds, have reduced evaporation and experience minimal breakup and drift during the drop. This means more product can be delivered more accurately to the drop zone.
- the visibility of water enhancers varies between products.
- water enhancers create a greater down draft in the drop zone.

### **Drop footprint characteristics**

The following drop footprint characteristics are based on observations during controlled drop testing.

- in comparison to class-A foams, water enhancer drops produce a narrower and shorter footprint with

well-defined edges and more uniform and consistent coverage of fuels.

- water enhancers provide insulating, wetting and cooling effects on the fuels they adhere to. This protects the fuels from heat until the water held within the water enhancer droplets evaporates. Water enhancers have high adherence to both horizontal and vertical surfaces.
- testing indicates water enhancers remain effective under sun and wind exposure for longer periods than class-A foam and water, as their evaporation rate is slower.

Water enhancers have a greater impact on objects located within the drop. This can result in matting down of grass fuels, creating a multilayered effect with untreated fuels potentially susceptible to fire under the drop.

As with other suppressants and retardants, water enhancers create slippery conditions within the drop zone.

### **References**

Biggs, H. (2012) Aerial suppression operations on public land within Victoria. Volume 1 Aerial suppressants, October 2012 (Draft). Department of Sustainability and Environment. Unpublished report.

Biggs, H. (2013) An operational review of aerially applied water enhancing polymers, November 2013 (Draft). Department of Environment and Primary Industries. Unpublished report.