



FIRE AND RESCUE DEPARTMENTS
OF NORTHERN VIRGINIA
FIREFIGHTING AND
EMERGENCY OPERATIONS
MANUAL

**Water Supply for
Suburban and Rural
Firefighting**
Fifth Edition

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PREFACE

Every year in the Northern Virginia area, fires occur in rural and non-hydrant areas that account for significant fire losses. These fires typically occur where hydrants are more than 2,000 feet from the occupancy on fire.

Historically, in the more rural areas, the dwellings and occupancies were small homes or outbuildings that did not require significant fire flows to accomplish extinguishment. However, with the continued use of lightweight construction and buildings with over 4,000 square feet of living space located in non-hydrant areas, water supply requirements have become critical. These incidents easily overwhelm the first-arriving companies and their ability to generate adequate water supplies.

The movement of water at fires will almost always consist of one of three types of operations: nursing operations, relay operations, or shuttle operations. In rare instances, a combination of these methods may be required. The goals of rural water supply operations are to be:

- **Rapid** (quickly deployed, supporting the initial attack).
- **Efficient** (providing maximum GPM/fire flow based on available water).
- **Expandable** (enabling the water supply to increase as needed).
- **Uninterrupted** (providing a continuous flow for the duration of the fire).

The purpose of this manual is to:

- Reduce the potential life and property loss by developing an adequate water supply.
- Stress the importance to identify all rural/non-hydrant boxes by dispatch.
- Develop a standardized build-up of resources and tactics to combat fires in non-hydrant areas.
- Develop the appropriate Incident Command System (ICS) to successfully manage water supply operations in non-hydrant areas.
- Identify common terminology.
- Describe the equipment to be used for rural water supply operations.
- Standardize the equipment to be used for all tanker companies.
- Develop standard deployment of operational units for fires in non-hydrant areas.
- Establish a Tanker Task Force response to be dispatched to all working fires in non-hydrant areas.
- Provide for a safe working environment for initial attack companies on these incidents.
- To define the duties and responsibilities of each responding unit.
- To define the duties and responsibilities of the water supply supervisor.
- To establish guidelines for apparatus positioning.

The following revisions were made in the manual for the fifth edition:

- Addition of language and roles of nursing operations.
- Defined role for 2nd arriving Command officer.
- Addition of direct fill nursing Operation.
- Revisions to graphics included in Appendix D.

Definitions

The key definitions used in this manual are as follows.

Attack Engine: The first-arriving engine on the scene of a working fire that deploys attack line(s).

Dump Site: The location for shuttle apparatus to dump water.

Dump Site Unit Leader (DSUL): The officer in charge (OIC) from the third engine will be tasked as the Dump Site Unit Leader (DSUL) and will manage the water supply operations until the arrival of an additional command officer or arrival of the command officer from the Tanker Task Force. The DSUL reports to the Water Supply Group Supervisor (WSGS) once established. The DSUL is responsible for setting up and maintaining the operations at the dump site, should confirm a staging area has been established and the best route of travel for tankers to prevent apparatus from obstructing access to the dump site.

Direct Fill: A nursing operation that provides immediate water to the fire ground eliminating the need for portable dump tanks. In addition, this rural water supply tactic delivers more resources to the incident scene affording the opportunity for a quicker size up and rapid-fire attack. In a short driveway scenario (less than 200'), the second tanker will transfer water to the first tanker and then become part of the shuttle operation. In the long driveway scenario (more than 200'), the second tanker will position to receive water from units in the shuttle and serve as the dump site.

Fill Site: The location where shuttle apparatus is filled for transport to the incident scene. Typically, this site will be staffed by an engine.

Fill Site Unit Leader (FSUL): The officer in charge (OIC) from the fifth engine supervises activities at the fill site. The fill site reports to the Water Supply Group Supervisor (WSGS) and is responsible for setting up and maintaining the operations at the fill site.

Large Diameter Hose (LDH): Supply hose of 4-inch diameter or greater.

Non-Hydrant: Includes all known locations where hydrants are more than 2,000 feet from a given structure. The definition of a non-hydrant area should include areas where the infrastructure has failed and/or limited-access highways where water supply operations may significantly affect the mitigation of the incident.

Nursing Operations: This procedure is used during initial fire attack and may be used in place of a dump site operation when the DSUL or WSGS deems it necessary. Typically, first arriving engine and first arriving tanker will be positioned at the fire location for attack and a tanker will be at the dump site supplying water to the attack apparatus through a clappered siamese valve. See graphic in [Appendix D](#).

Nurse Tanker: A tanker that proceeds with the initial attack engine to the incident scene and provides water as needed for the initial attack. This tanker will position in close proximity to the attack engine and acts as an extension of the attack engines booster tank.

Relay Operations: Generally, this procedure uses three or fewer engines to supply the attack engine(s) directly from the water source through a supply line that should not exceed 3000 feet from the incident.

Rural Water Supply: The procedure of supplying water for firefighting purposes in areas where an adequate and reliable water supply system does not exist.

Shuttle Operations: The procedure of using engines and tankers to move water from a fill site to the incident scene.

Shuttle Route: The safest and most efficient route possible for shuttle apparatus to use in transporting water from the fill site to the incident scene.

Siamese: For the purpose of this manual, a siamese is any appliance designed to bring two or more supplies lines together, such as 4-inch siamese, manifold, or gated wye set up for 4-inch Storz connections for the dump site.

Tanker: Apparatus designed to transport water from a fill site to the incident scene. The NOVA recommendation for a tanker is a minimum 1000-GPM pump and a 2,000-gallon water tank.

Tanker Task Force: Three tankers, one engine, and one command officer.

Water Supply Group (WSG): is a group established by the Incident Commander (IC) and given the primary responsibility of supplying water to the incident scene to meet the needs of the incident. The WSG should operate on a separate radio channel for water supply operations.

Water Supply Group Supervisor (WSGS): The third due engine officer, working as the DSUL, will be initially responsible for the duties of the WSGS until relieved. The second arriving Command officer should be assigned the WSGS. The WSGS reports to the IC and is assigned the role of developing an adequate water supply delivery system and the management of all resources assigned to the water supply operations.

COMMAND PROCEDURES FOR WATER SUPPLY

The following section outlines the command procedures for water supply operations.

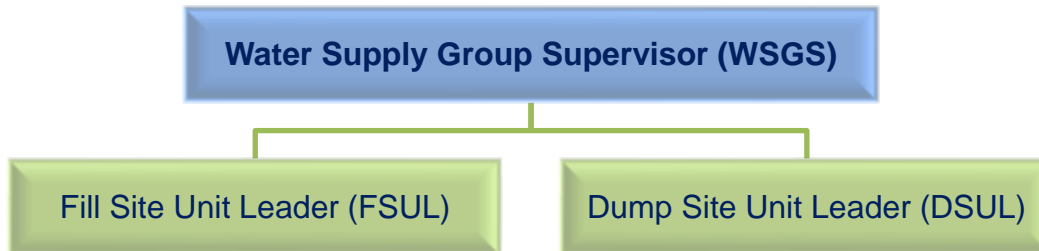


Figure 1: Sample ICS chart for rural water supply operations.

Water Supply Group Supervisor (WSGS)

The WSGS is normally established by the third-arriving engine officer until relieved by the 2nd arriving command officer. The roles and responsibilities of the Water Supply Group Supervisor (WSGS) include:

- Supervise the Water Supply Group, which is responsible for providing adequate water to the incident. Strategically locating the WSGS at the Dump Site is preferred.
- Evaluate the filling and transit capacity of the operation and expand/contract the group and number of fill sites accordingly.
- Establish and coordinate the fill sites, dump sites, shuttle routes, and/or relay operations in both hydrant and non-hydrant areas.
- Determine with the Incident Commander (IC) the water supply needs of the incident.
- Keep command apprised of the amount of water available upon request.
- Coordinate traffic control with law enforcement as required.
- Ensure tankers get priority at the fill and direct fill sites.
- Ensure adequate resources are available to support the water supply group.
- Establish an alternate radio channel or channels for the water supply operations.

Dump Site Unit Leader (DSUL)

The initial roles and responsibilities of the Dump Site Unit Leader include:

- Manage all activities at the dump site.
- Evaluate and implement travel route for incoming tankers. If a shuttle is to be used, recommend the travel route of tankers to ensure units are moving in a loop.
- Designate a staging area for units that will be abandoned so not to impede traffic.
- Evaluate and adjust water supply operations as needed.
- Keep WSGS apprised of the amount of water available.
- Coordinate traffic control with law enforcement as required.
- Ensure tankers get priority at the dump sites.

- Ensure water is transferred in the safest and most efficient manner possible, minimizing any loss of water.
- Calculate turnaround time and GPM per unit in shuttle and provide total GPM to WSGS.
- Expand nursing or dump site operations as needed to maintain needed fire flow and shuttle capacity.
- Monitor dump site operations for safety. Special attention should be given to backing apparatus.

A critical maintenance role of the Dump Site Unit Leader is to monitor dump site operations constantly and continuously for safety. There are many very large moving vehicles, often backing up, as well as wet ground and trip hazards. The Dump Site Unit Leader should provide personnel operating in the area with appropriate protective safety vests, ensure appropriate dump site lighting, minimize the strobes and other lights that may blind incoming drivers, and, in rare instances, appoint a safety officer to the dump site.

At some point, the GPM supplied by engines will cease to be a viable supply (750 gallons with 20-minute round trip = 37 GPM). The WSGS and DSUL need to be cognizant of this and, on large events, request additional tankers to replace them early enough to prevent water supply interruptions. This is especially true on fires where the closest water is an underground tank. Three tank loads will exhaust a 10,000-gallon supply, necessitating moving to a more distant supply.

Fill Site Unit Leader (FSUL)

The roles and responsibilities of the Fill Site Unit Leader include:

- Manage all activities at the fill site.
- Keep WSGS apprised of the fill site conditions upon request.
- Coordinate traffic control with law enforcement as required.
- Ensure tankers get priority at the fill sites.
- Ensure units are filled in the most efficient and safest manner possible.

OPERATIONAL PROCEDURES

The following sections outline the procedures necessary for the successful operation of the dump and fill sites. The first-arriving engine company is responsible for determining the water supply plan enroute to the call using the map book or preplan. The first-arriving engine officer shall determine and announce the fill site locations, including type/capacities and which water supply operations that will be used. An example of this radio traffic is:

“Loudoun from E604, the primary water supply will be a 30,000-gallon storage tank located across from 1234 Sample Court. We will be setting up for a nurse operation.”

Dump Site Operations – Tankers have Priority at Dump Sites!

The dump site is typically located near the end of the driveway leading to the structure but must be in a location that allows for easy access, turnaround, and travel routes for shuttle operations.

- Companies arriving on the scene after the dump site has been created need to support the water supply by transferring their water to the dump site.
- Either a tanker will position as the dump site or portable/dump tanks will be used.
- Engine companies involved in the shuttle operation will attach to supply lines away from the dump site and pump their water off. Engine companies shall not impede the movement of tankers through the dump site area.
- The DSUL needs to be very cognizant of the fact that apparatus will be moving through the site. Safety of the personnel is paramount.
- Water is a very important resource! DO NOT WASTE WATER!
- Personnel at the dump site need to wear appropriate PPE, including traffic vests and firefighting helmets.
- Water supply or shuttling units may need to be staged and directed into the dump site as needed to keep the operation moving efficiently.

Fill Site Operations - Tankers have Priority at the Fill Sites!

Typically, the fifth engine is responsible for setting up and maintaining the fill site; the engine OIC will be the Fill Site Unit Leader.

- The first engine shall communicate the fill site location. Tankers have priority at the fill sites; they need to have a designated fill position that does not become encumbered by engines.
- Fill site engines with electronic governor controls need to always draft and fill in RPM mode, pressure mode can cause damage to tanks! When drafting, the engine company is generating no pressure and the pump will think it is cavitating, causing the built-in safety

mechanisms to shut down the pump after a short period of time. When in RPM, this does not occur and allows the engine company to perform the draft.

- The fill site crew will connect and disconnect the fill lines as needed to facilitate a rapid turnaround for units coming and departing the fill site.
- The FSUL needs to ensure apparatus moves efficiently through the fill site.
- The FSUL is responsible for site safety and ensuring all personnel know their assignments.
- Personnel at the fill area need to wear the appropriate PPE to include traffic vests and shall wear personal flotation devices (PFDs) **if working within 10' of an open water source.**

The Fill Site Unit Leader must keep the WSGS updated constantly on the status of the fill site and its capacity. The WSGS may need to consider more than one fill site based on this critical information, so it is important to monitor, collect, and transmit this mission-critical information.

GENERAL CONSIDERATIONS

There are several general issues of importance when considering water supply for suburban and rural firefighting:

- Tanker and rural water supply (drafting) operations need to be practiced on a regular basis.
- The ability to build up and support these incident operations need to be identified early, and additional resources need to be called for at that time.
- Build-up and support for this operation is time consuming and calls for an extremely proactive approach by the initial IC.
- Units and personnel at the dump and fill site need to be very conservative in their water management. Water should not be wasted at either site; it needs to be handled efficiently so it can be transferred to the attack engine for use on the fire ground.
- Travel lanes between the dump and fill site(s) must remain open and where possible wide enough for tankers to pass.

Tanker Flow Calculations

The fire flow that can be obtained from a particular unit can be estimated using the following formula: Total Capacity of Tanker minus 20% divided by the round-trip time.

$$\text{Tanker Flow} = \frac{(\text{Capacity} - 20\%)}{\text{Round Trip Time}}$$

Example: A Tanker with 2,500 gallons of water and a travel and fill time of 10 minutes will typically provide 200 gallons per minute fire flow on the fire ground:

$$\text{Capacity of 2,500 minus 20\% (2,500 minus 500) = 2,000}$$

$$2,000 \text{ divided by the 10-minute round trip} = 200 \text{ gallons per minute}$$

RURAL WATER SUPPLY AREA PREPLANNING

Preplanning areas where there are no hydrants is extremely important to allow operations to be initiated at the earliest possible moment. A comprehensive preplan needs to be developed. This preplan could be included on map book pages or be separate document.

Homes and other occupied structures in non-hydrant areas need to be identified and water supply area preplan needs to be completed to ensure adequate water supply can be established.

It is recommended that preplans for all non-hydrant areas be completed and sent to all applicable engine companies and the tanker stations for inclusion in a rural water supply preplan book. (Ensure neighboring jurisdictions are included in this effort.)

All stations shall maintain a rural water supply preplan book in either paper or electronic format. New streets and preplans shall be added in the book as they become available.

WATER USAGE AGREEMENT

The Code of Virginia (2015) Title 27 § 27-20 (Chapter 2 – Fire Departments and Fire Companies, Section 27-20) has been interpreted as allowing fire departments and fire companies the right to acquire water from whatever source is available, “to prevent the spread of fire.”

It would be beneficial from a public relations perspective for the departments to have a water usage agreement with owner(s) of preplanned water sources. Therefore, every reasonable effort should be made to contact owners of privately owned water sources (with no public access). A Water Usage Agreement ([Appendix C](#)) should be filled out, signed by the respective parties, and kept on file. This shall apply to both static and non-static sources.

FIRE OPERATIONS

A Tanker Task Force will be dispatched on all structure fire incidents in non-hydrant areas. If this is not done at dispatch through the communications center, the task force should be added at the discretion of the first-arriving engine company or the first-arriving command officer.

In addition to the first alarm, the minimum dispatch for a Tanker Task Force shall consist of the following units:

- One engine
- Three tankers
- One command officer

If tankers are dispatched without engines, it is strongly recommended an additional firefighter is placed on the unit for a crew of two. This will increase the safety of the crew responding to the incident, as well as allow for greater efficiency when performing the tasks required on the scene or at the fill site.

Size-Up and Situation Reports

The first-arriving company in a non-hydrant area must provide a good concise situation report to the balance of the assigned units coming to the scene. The first-arriving officer needs to do a very good risk benefit analysis to determine whether to commit to an offensive operation based on the visual cues available to them on arrival. Additionally, the OIC needs to base their tactics and fire flow requirements on the anticipated water supply.

Based on the risk benefit analysis, the first-arriving engine company officer must start to develop the appropriate organizational structure to manage the incident. This should be started early and needs to be correct for the incident at hand.

If there is a need to initiate interior offensive operations, it needs to be started as soon as feasible. (Consideration should be given to use CAFS, Class A foam solution, or Class B foam lines to maximize resources; by using foam, crews can effectively extend firefighting operations by using less water.)

While enroute to the fire, the first-arriving engine officer needs to begin to set up for water supply operations. With the appropriate area preplan, the officer can designate dump sites, fill sites for the shuttle operation, or relay positions that will allow in-coming units to take their pre-determined positions.

ROLES AND RESPONSIBILITIES

Nursing Operations

First Engine

- Arrive and layout LDH with a siamese from a point that is suitable for the selected rural water supply operation.

First Tanker (Nurse Tanker)

- Arrive and position in close proximity of the attack engine.
- Connect a LDH supply line to the attack engine and supply water.
- If the first arriving engine does not drop a siamese, the tanker should drop theirs.

Second Engine

- Arrive at the incident scene and complete the setup of the nursing operation.
- Engine will supply their water into the system when no tankers are available.

Second Tanker

- Arrive at the nursing site and supply their water into the system.
- Join the water shuttle operation.
- If a combination operation is anticipated, consider dropping rural water supply (RWS) equipment as needed.

Third Engine

- The officer of the third-arriving engine will assume the role of the DSUL.
- The DSUL will manage the responsibilities of the WSGS until relieved.
- Engine will supply their water into the system when no tankers are available.
- Position out of the route of travel.

Fourth Engine

- Engine will supply their water into the system when no tankers are available.
- Position out of the route of travel and crew becomes Rapid Intervention Team (RIT).

Fifth Engine

- Arrive at the fill site and the officer will assume the FSUL position under the WSGS.
- Establish two fill stations positioned sufficiently apart to permit ease of vehicle movement.

Additional Tankers

- Arrive at incident and transfer water into the system.
- After transferring water, unit will become part of the water shuttle operation.

Additional Apparatus (including units on the first alarm)

- Report to the incident scene, dump anticipated equipment/personnel, and move the vehicle to a staging area out of the way of the route of travel. Engine companies may be directed to become part of the water shuttle.

Nursing Operation: Direct Fill Option

First Engine

- If responding with a tanker, the first due engine will drive directly to fire location.
- If the dump site is less than 200 feet away from incident, the first due engine will lay in or hand jack hose back to dump site.

First Tanker

- If the dump site is less than 200 feet from incident (short lay), position out of route of travel at dump site, and connect a line to the 4-inch siamese valve attached to the first engine's supply line and serves as the direct fill tanker at dump site (Consider positioning in entrance to driveway).
- If the dump site is more than 200 feet but less than 1000 feet from incident (long lay), proceed with the first engine to the incident scene and supply water to the first engine.
- If the dump site is more than 1000 feet from incident, refer to the preplan and lay out a supply line from predetermined location to the first engine.
- First tanker should drop their 4-inch siamese valve at the dump site before proceeding to the first engine's location.
- Connect the supply line from tanker to the first engine for nursing operation and supply water to the first engine.

Second Engine

- If the incident is less than 200 feet from the dump site and the first tanker is on scene, the driver transfers water to the tanker.
- If no tanker is on scene, supply water to the first engine through a 4-inch siamese valve.
- The engine becomes part of shuttle operation.
- If the dump site is more than 200 feet but less than 1000 feet from incident, layout from the dump site to the first tanker and prepare to supply water to the tanker.
- If the dump site is more than 1000 feet from incident, layout from the predetermined location in the preplan.
- The crew goes to the incident scene to deploy a second hoseline.

Second Tanker

- If the dump site is less than 200 feet from the incident, the driver transfers water to the first tanker (dump site) and becomes part of the water shuttle.
- If the dump site is more than 200 feet from the incident, position out of route of travel at the dump site, connect a line to a 4-inch siamese valve attached to the second engine's supply line, and prepare to serve as the direct fill tanker at the dump site (Consider positioning in entrance to driveway).
- With assistance of the crew from the third engine, set up multiple lines to the second tanker's intakes (dump site), so water can be nursed off all incoming water shuttle units.

Third Engine

- Third engine officer assumes position as the Dump Site Unit Leader (DSUL).
- Driver transfers water to the tanker at the dump site.
- Third Engine becomes part of the shuttle operation.

- The DSUL will head up water supply operations until the second battalion chief establishes Water Supply Group (WSG).

Fourth Engine

- Officer and 2 firefighters proceed to the incident scene and become the Rapid Intervention Team.
- Driver transfers water to the tanker at the dump site and engine becomes part of the shuttle operation.

Fifth Engine

- The officer will become Fill Site Unit Leader (FSUL) and will be under the direction of the WSG supervisor.
- Respond to fill site location with the crew to begin fill site operations.
- At least 2 lines will come from the engine to facilitate the rapid filling of units coming to fill site (Tankers will have priority and should have a designated fill position).

Additional Tankers

- Arrive at incident and transfer water into the system.
- After transferring water, unit will become part of the water shuttle operation.

Additional Apparatus (including units on the first alarm)

- All other responding apparatus should report to the incident scene, dump anticipated equipment/personnel, and move the vehicle to a staging area out of the way of the route of travel. Engine companies may be directed to become part of the water shuttle.

Shuttle Operation

Note – Engines may be used to shuttle water only if needed.

First Engine

- Arrive and layout LDH with a 4-inch siamese from a point that is suitable for the selected rural water supply operation.

First Tanker (Nurse Tanker)

- Arrive and position in close proximity of the attack engine.
- Connect a LDH supply line to the attack engine and supply water.
- If the first arriving engine does not drop a siamese, the tanker should drop one.

Second Engine

- Follow instructions from the first engine for layout directions.
- Establish nursing operations to minimize interruptions to water supply while setting up the dump site.
- Establish dump site operations. Leave the nursing operation setup in place to supplement the water supply or to respond to a failure of the dump site operation.

Second Tanker

- Arrive at the nursing site and supply their water into the system.
- Join the water shuttle operation.
- If a combination operation is anticipated, consider dropping RWS equipment as needed.

Third Engine

- The officer of the third-arriving engine will assume the role of the DSUL.
- The DSUL will manage the responsibilities of the WSGS until relieved.
- Crew completes the setup of and staffs the dump site.
- Engine will supply their water into the system when no tankers are available.
- Position out of the route of travel.

Fourth Engine

- Officer and 2 firefighters proceed to the incident scene and become the Rapid Intervention Team.
- Driver transfers water to the tanker at the dump site and engine becomes part of the shuttle operation, if needed.

Fifth Engine

- Engine will supply their water into the system when no tankers are available. Driver becomes part of the shuttle operation Fifth Engine (Fill Site Engine)

- Arrive at the fill site and the officer will assume the FSUL position under the WSGS.
- Establish two fill stations positioned sufficiently apart to permit ease of vehicle movement.

Additional Tankers

- Arrive at incident and transfer water into the system.
- After transferring water, unit will become part of the water shuttle operation.

Additional Apparatus (including units on the first alarm)

- All other responding apparatus should report to the incident scene, dump anticipated equipment/personnel, and move the vehicle to a staging area out of the way of the route of travel.

Relay Operations

With proper preplanning, relay operations with 4-inch hose are feasible at distances over one mile. It is recommended a water shuttle supplement the relay as it is being set up due to the time parameters of laying large amounts of hose. The low friction loss makes long relays a viable option.

Relay operations need to be preplanned and the preplan needs to be followed.

The rural water supply relay operation is a time-consuming operation, and a Tanker Task Force needs to be dispatched to these incidents to ensure an adequate supply of engine companies to complete the hose lay.

Additional tankers and engines that are not needed to accomplish the relay can supply their water to the fireground through a designated relay engine. The third-arriving engine company officer shall assume the role of the WSGS until relieved. The WSGS shall designate which engine is to accept the water from the supplementing units.

Fire Boat Operations

Fire boats can be used as a drafting unit to supply a relay, supplement an established water supply, or supply a fill site for a shuttle operation.

Command should consider setting up a land-based water supply operation by calling for a Tanker Task Force due to the limited number of fire boats and the possibility of extended response time. An engine company needs to be assigned to the fire boat's location to assist with the setup.

NON-DOMESTIC HYDRANT WATER SOURCES

Dry Hydrants

Dry hydrants are typically installed in ponds, lakes, or streams but could also be found attached to swimming pools. Dry hydrants, when installed properly, will bring the water source to an accessible location. The water should not freeze in the winter due to the depth of dirt over the water level in the piping. Dry hydrants should be back flushed and tested every six months. All units need a 4½-inch to 6-inch double female National Pipe Taper (NPT) bell adapter and a 6-inch double female to draft from a dry hydrant.

Local fire departments must have a contingency plan in times of drought.

(The Commonwealth of Virginia has had grants to facilitate the installation of the dry hydrant. Information about dry hydrants can be found in [Appendix E](#).)

Storage Tanks

The developers of subdivisions sometimes install storage tanks for neighborhood or firefighting water supplies. Upkeep of these tanks and piping is a concern; in some areas, it is not clear who is responsible for the maintenance of these systems.

Tanks are normally underground and set up for drafting operations. Tanks sizes can vary widely. Due to tank design, it is impossible to draft all water from the system.

Systems should be checked every six months for proper operation.

Due to typical tank sizes, these systems should not be used as the sole water source.

Static Water Sources

Static water sources can include ponds, lakes, bays, rivers, streams, and pools. The success of using a static water source depends on the accessibility and the water depth.

Weather can hinder the use of static water sources; in drought conditions, the water levels can be too low. In extreme cold weather, ice must be cut. In flooding conditions, debris can clog strainers.

Swimming pools can be used as a static water source. Many pools depend upon water weight to support the construction of the pool or to keep the pool in the ground. Consider the risk vs. benefit before using pool water, especially from a neighbor's home.

APPENDIX A – RECOMMENDED EQUIPMENT CACHES

The recommended minimum equipment cache to be carried on all tankers is as follows:

- ✓ Dump tanks – one or two, total size must be at least capacity of tank
- ✓ Two 6-inch hard sleeves
- ✓ 6-inch low-level strainer
- ✓ 4-inch siamese, manifold, or wye
- ✓ Siphon device to move water from one tank to another
- ✓ Floating dock strainer
- ✓ Supply line (size and amount varies depending on unit)
- ✓ Adapters 2½-inch to 4-inch (all 4-inch to be Storz connections)
- ✓ Adapters 5-inch to 6-inch
- ✓ Adapters 4½-inch to 6-inch
- ✓ Salvage covers for under tanks
- ✓ Supply line holder – 3-inch or 4-inch
- ✓ Water Supply Officer bag*
- ✓ Water supply preplan book

The recommended minimum equipment to be carried on engines where rural/suburban water supply areas are present:

- ✓ Two 6-inch hard sleeves
- ✓ 6-inch floating dock strainer
- ✓ Supply line – minimum 1,000 feet of LDH or 2,000 feet 3-inch
- ✓ Siphon device to move water from one tank to another
- ✓ Adapters – 5-inch to 6-inch
- ✓ Adapters – 4½-inch to 6-inch double female
- ✓ Adapters – four 2½-inch male to 4-inch Storz
- ✓ Adapters – four 2½-inch female to 4-inch Storz
- ✓ Water Supply Officer bag*
- ✓ Water supply preplan book
- ✓ 4-inch siamese, manifold, or gated wye set up for 4-inch Storz connections for dump site operations
- ✓ Two gated wyes or manifold set up for 4-inch to two 2½-inch connections for the fill site
- ✓ Personal flotation devices
- ✓ Jurisdiction's water supply preplans

Recommended equipment to be carried on all command vehicles is:

- ✓ Water Supply Officer bag*

- ✓ Jurisdiction's water supply preplans

*The Water Supply Officer bag includes:

- ✓ NOVA quick reference guide
- ✓ Tanker capacity guide
- ✓ Water supply worksheets
- ✓ One notepad
- ✓ Two stop watches
- ✓ One handheld calculator
- ✓ Water Supply Group Supervisor vest

APPENDIX B – TOOLS AND EQUIPMENT

This section will discuss recommended tools and equipment for water supply operations. Equipment may vary in style and manufacture depending on jurisdiction.

Dump Tanks

Dump Tanks are portable water tanks that can be set up to augment the water supply in a tanker shuttle operation, Figure 2. The preferred method for continuous water supply at a rural water supply operation is the nursing / direct fill method and utilizing a tanker to nurse the attack engine.



Figure 2: Dump tanks.

Typical sizes of dump tanks:

1500 Gallons	10'3" by 10'3" by 30"
2100 Gallons	11'3" by 11'3" by 30"
2500 Gallons	12' 3" by 12' 3" by 30"
3000 Gallons	13'3" by 13'3" by 30"

Low-level Suction Strainer

Low-level suction strainers are for use in dump tanks, Figure 3. They allow the engine company drafting to make the best use of all available water in a dump tank down to a water level of approximately two inches. The maximum flow for a low-level strainer is 750 GPM.



Figure 3: Low-level suction strainer.

Low-profile Jet Siphon Strainer

Low-profile jet siphon strainers, Figure 4, allow engines the ability to get water from the dump tanks without having to draft. By charging the 1¾-inch hoseline, a continuous flow is established. This device can be used to transfer water from one tank to another. The general rule of thumb is the minimum flow for a Jet Siphon Strainer is approximately 500 GPM but varies by manufacturer. Operators need to be familiar with the specifications of the equipment.



Figure 4: Low-profile jet siphon strainer.

Supply Line Holder

Supply line holders allow personnel assigned to the dump site to set up fill lines for the tanks using 3- or 4-inch hose, Figure 5 and Figure 6. This holder will replace a firefighter typically needed to hold the line while it is discharging into the tank.

Sections of 3- or 4-inch hose are recommended to allow engines to connect and pump off water away from the draft site, which allow tankers easy access to the dump tank.



Figure 5: LDH Supply line holder.



Figure 6: 3-inch Supply line holder.

Jet Siphon

The jet siphon, Figure 8, is an auxiliary item that helps move water between dump tanks and helps with water conservation in the operation. By using the venturi effect, the siphon moves up to 800 GPM between the tanks as needed.



Figure 8: Jet siphon.



Figure 7: Floating dock strainer.

Floating Dock Strainer

A floating dock strainer allows engines or tankers to draft from a static water source, Figure 7. The strainer floats on the surface of the water and does not need additional equipment to keep it off the bottom of the water source.

Turbo Draft

A turbo draft device allows a unit to access a water supply that would normally be out of reach when using a hard-suction hose, Figure 9. The turbo draft works off the venturi principle and the unit is supplied by either a 2½-inch or 3-inch line with the return being LDH.



Figure 9: Turbo draft.

Automatic Air Primer

The automatic air primer is a tool that can be included with new apparatus or retrofitted to existing apparatus. The automatic air primer uses the venturi principle to evacuate air from suction hoses and the pump by using the air supply from the apparatus onboard air tanks. When

placed in the automatic mode, this device will allow for the primer to automatically begin priming whenever the discharge pressure drops below 20 PSI.



Figure 10: Automatic air primer.

Gated Wyes/Siamese

The following are types of gated wyes/siamese:

Gated Wye Set up for LDH and two 3-inch lines for use at fill sites.



<p>Gated Wye set up for LDH lines for use at direct fill sites when a LDH siamese is not available.</p>	
<p>LDH Siamese</p>	
<p>Triamese</p>	

APPENDIX C – WATER USAGE AGREEMENT

WATER USAGE AGREEMENT

I/We, the undersigned owner(s) of a lake, pond, creek or other fixed body of water located at _____ do hereby grant the fire departments permission to use the body of water for emergency incident mitigation.

All other uses of said body of water shall be after notification and permission of the owner(s).

This contract can be cancelled at any time by written notice given thirty days in advance to the fire department.

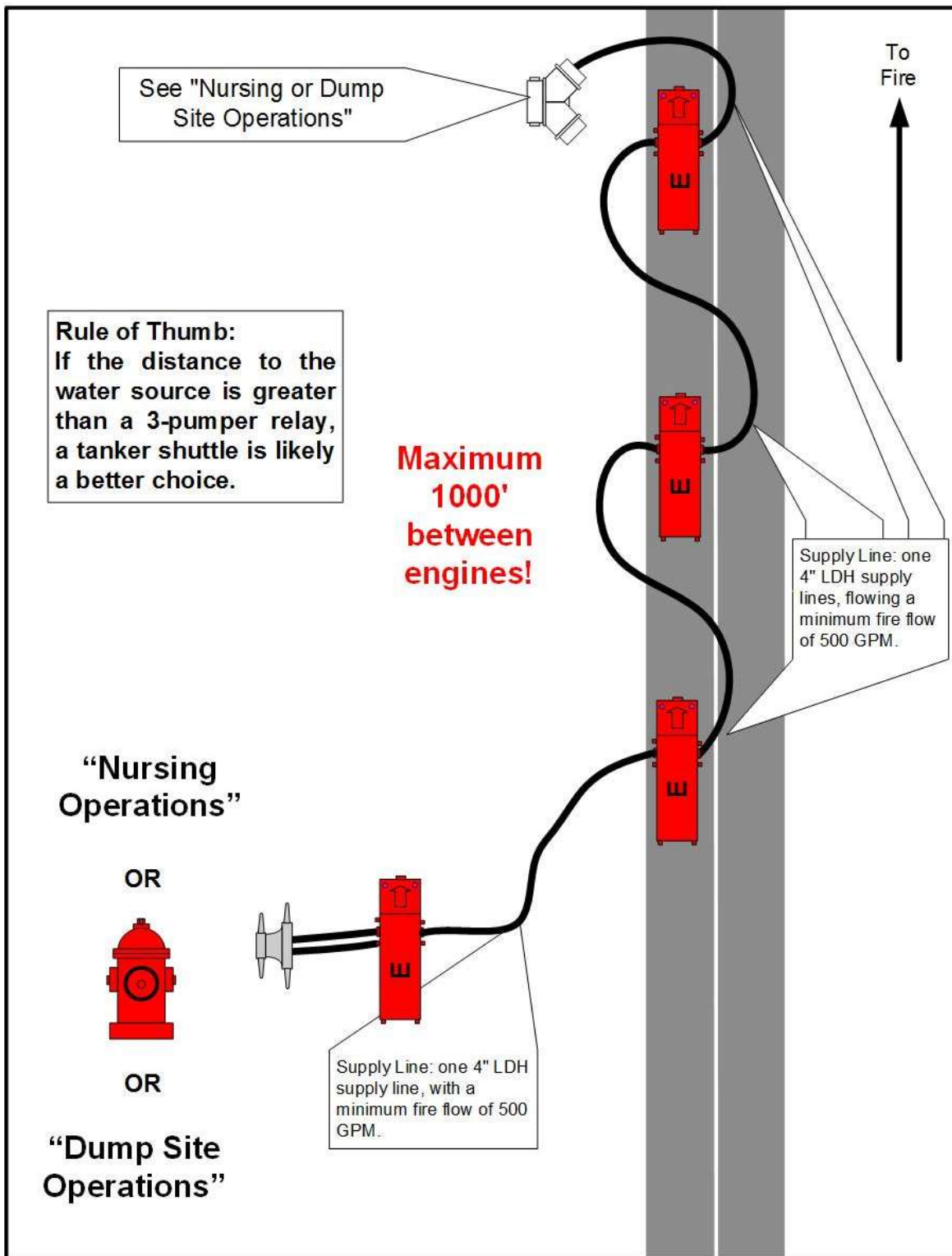
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OWNER DATE

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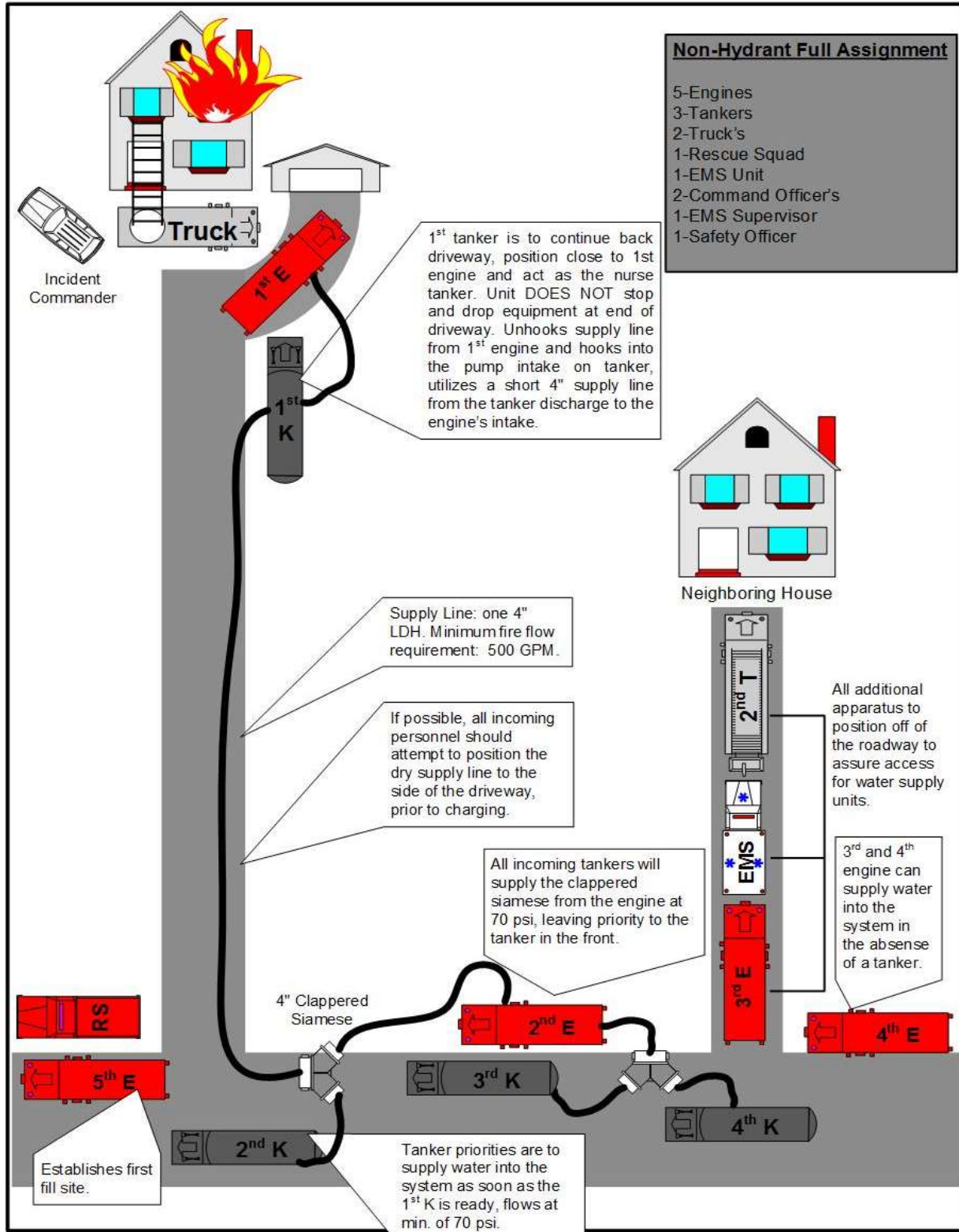
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WITNESS

APPENDIX D – WATER SUPPLY GRAPHICS

Relay Operations



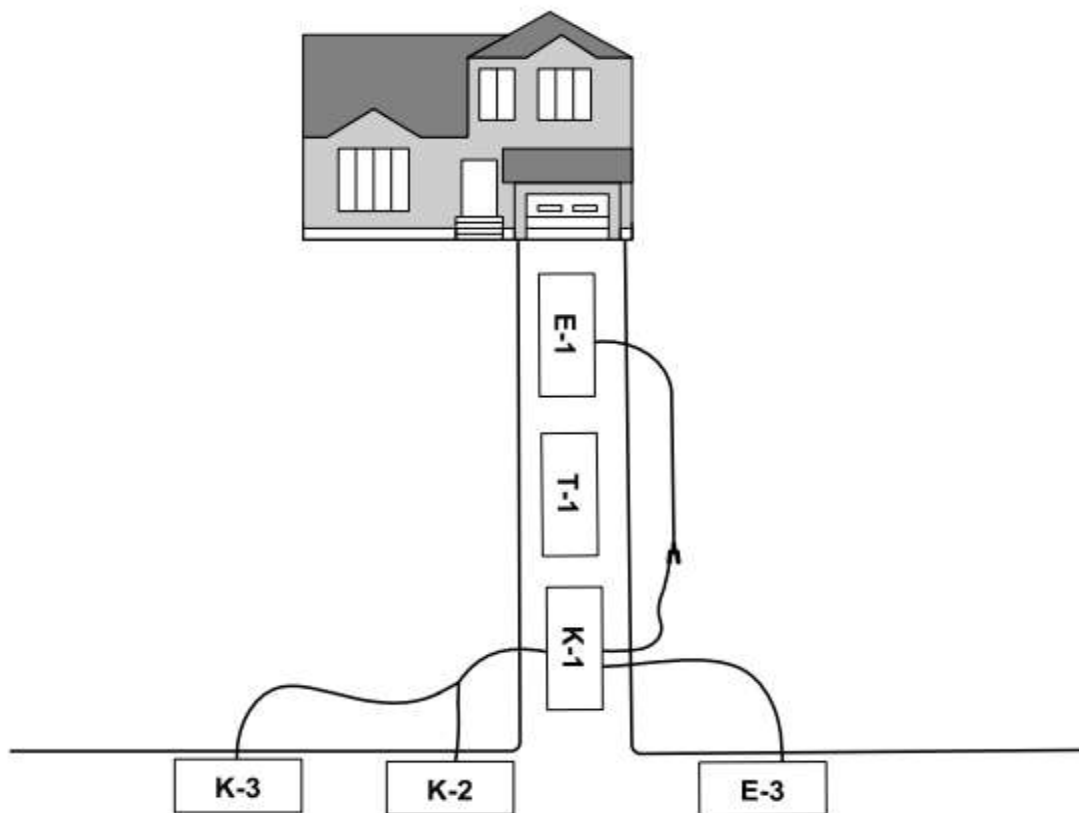
Nursing Operations



Direct Fill – Short Lay

Short Lay (200' or less)

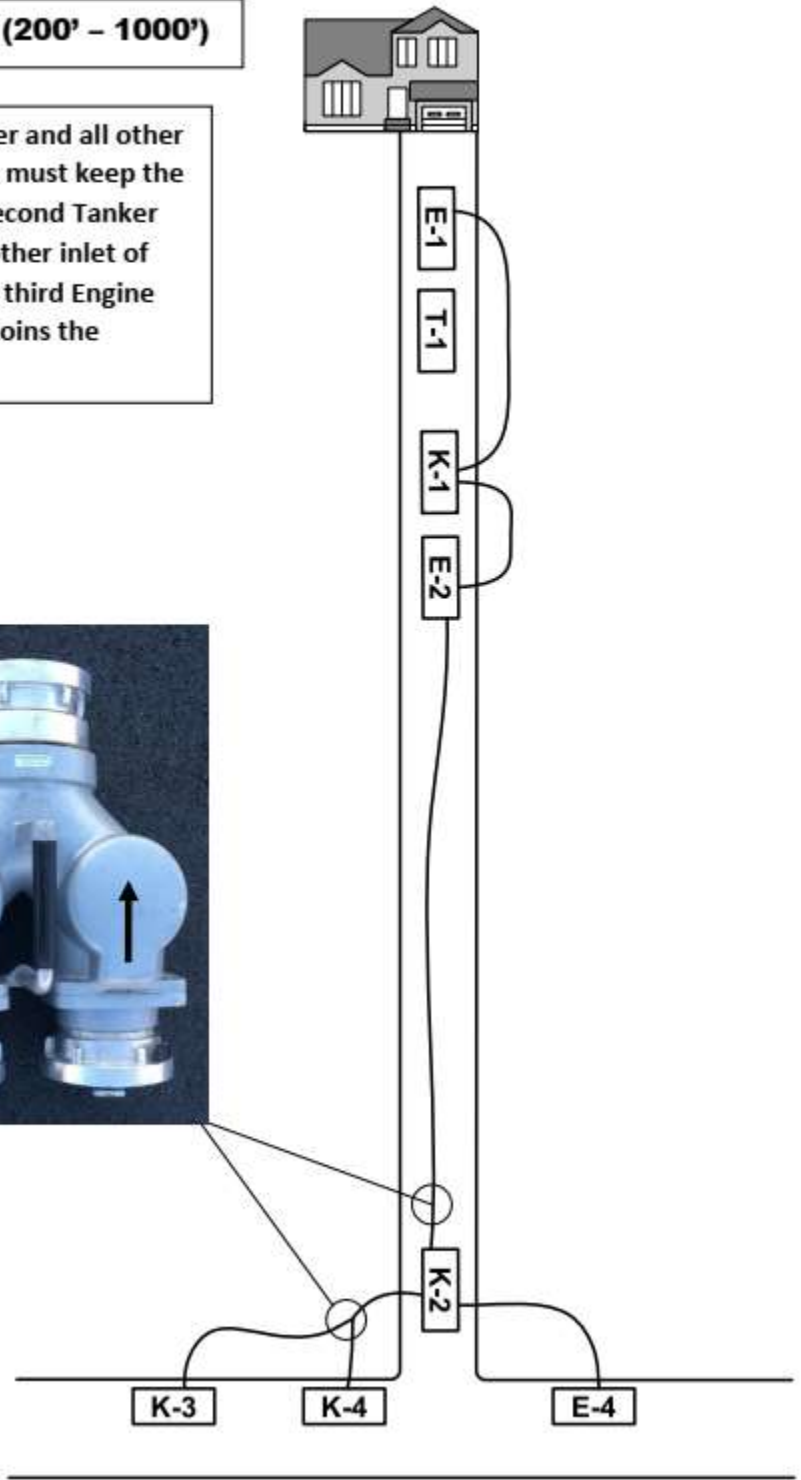
The third engine is responsible for dump site set up and should stay with the tanker to assist with shuttle connections and traffic. The third engine officer is the initial Water Supply Group Supervisor (WSGS) in charge of dump and fill sites and routes of travel. Upon the arrival of the second Chief Officer, they will assume the position of the WSGS, the the third engine officer assumes the Dump Site Unit Leader (DSUL).



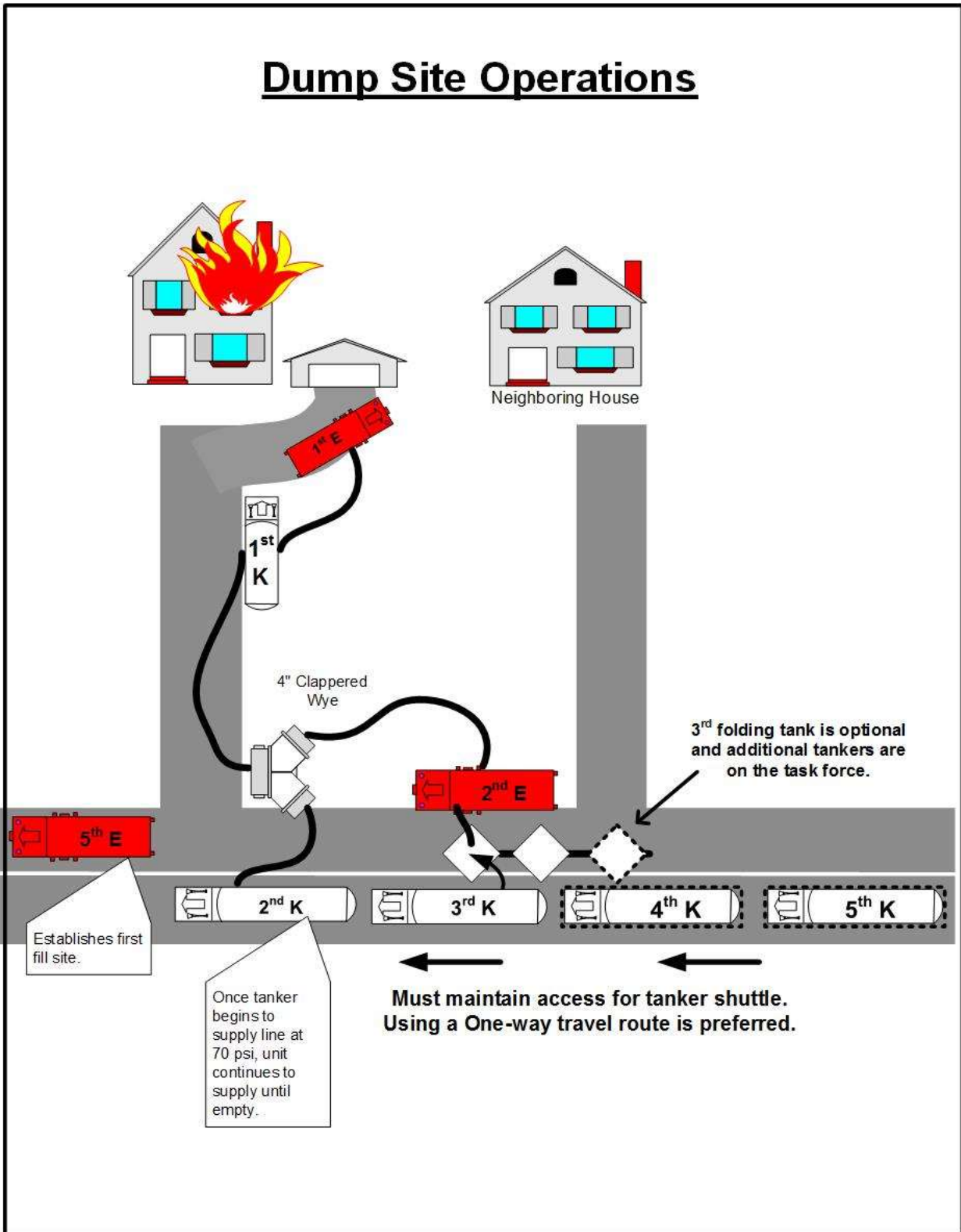
Direct Fill – Long Lay

Long Driveway (200' – 1000')

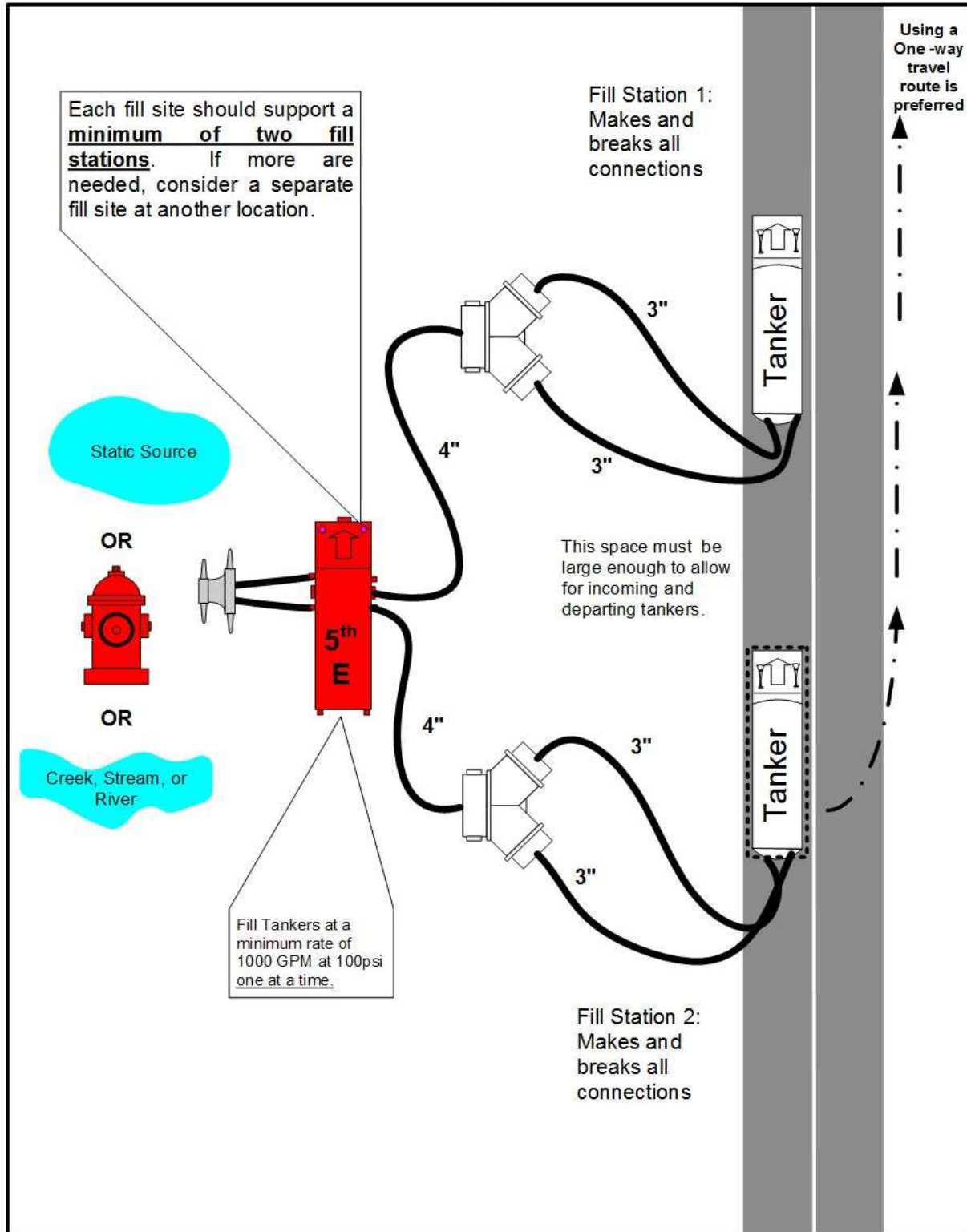
The second Tanker and all other non-shuttle units must keep the road clear. The second Tanker connects to the other inlet of the Siamese. The third Engine disconnects and joins the shuttle.



Dump Site Operations



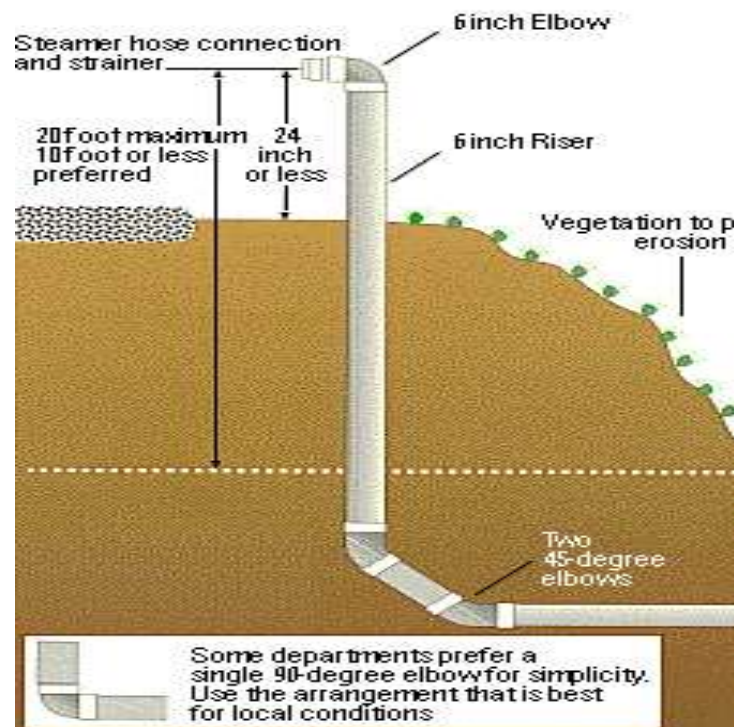
Fill Site Operations



APPENDIX E – DRY HYDRANTS AND STORAGE TANKS

Typical Dry Hydrant

Note: Back flush system prior to use.



Typical Water Storage Tank

Note: Tank sizes vary. Systems must be refilled after use.

