Tata & Howard, Inc.

Fire Flow Test

Community:___Upton, MA_____

Client: ____Town of Upton_____

Date:____3-9-2011_____ **Time:**_____
Weather:_____ **Inspector:**___PLF/JVH_____
_____

System Conditions: _____

_____

Hydrant Location:	**Test No. _9_**	**Test No. _10_**
Flowing Hydrant:	H-123 (Mechanic Street)	H-113 (Williams Street)
Residual Hydrant:	H-122 (Mechanic Street)	H-114 (Williams Street)
Flowing Hydrant:		
Flow Opening (Inches)	2.5 inches	2.5 inches
No. Butts Flowing	1	1
Static Pressure	105 psi	65 psi
Pitot Reading	60 psi	32 psi
Hydrant Coefficient	0.9	0.9
Flow (GPM) (Qf)	1300	950
Residual Hydrant:		
Static Pressure (Hs)	122 psi	82 psi
Residual Pressure (Hf)	116 psi	64 psi

Test No. 9 Q = **___1300____** $\left(Qf \frac{____Hs - _20___}{____Hs - ___Hf} \right)^{.54}$ = __6000____GPM @ ___20___ PSI

Test No. 10 Q = **__950___** $\left(Qf \frac{____Hs - _20___}{____Hs - ___Hf} \right)^{.54}$ = __1850____GPM @ ___20___ PSI

Calculated By:____PLF_____

Checked By:_____JVH_____

Tata & Howard, Inc.

Fire Flow Test

Community: Upton, MA

Client: Town of Upton

Date: 3-9-2011 **Time:**

Weather: **Inspector:** PLF/JVH

System Conditions:

Hydrant Location:	**Test No. _11_**	**Test No. _12_**
Flowing Hydrant:	H-254 (Maple Avenue)	H-134 (Warren Street)
Residual Hydrant:	H-147 (Maple Avenue)	H-133 (Warren Street)
Flowing Hydrant:		
Flow Opening (Inches)	2.5 inches	2.5 inches
No. Butts Flowing	1	1
Static Pressure	130 psi	80 psi
Pitot Reading	85 psi	45 psi
Hydrant Coefficient	0.9	0.9
Flow (GPM) (Qf)	1150	1127
Residual Hydrant:		
Static Pressure (Hs)	122 psi	97 psi
Residual Pressure (Hf)	114 psi	93 psi

Test No. 11 $Q = 1150 \left(Qf \frac{Hs - 20}{Hs - Hf} \right)^{.54} = 6120$ GPM @ 20 PSI

Test No. 12 $Q = 1127 \left(Qf \frac{Hs - 20}{Hs - Hf} \right)^{.54} = 5560$ GPM @ 20 PSI

Calculated By: PLF

Checked By: JVH

Appendix D

N

HOPKINTON

GRAFTON

NORTHBRIDGE

HOPEDALE

MENDON

North Street
Booster Pump Station

Pratt Hill Water Storage Tank

Pearl Street Water Storage Tank

3. Meadow Drive
New 8-inch water main

1. Mendon Street
New 12-inch water main

Glen Avenue Well Field
& Pump Station

Grafton Water District
Interconnection

2. Harford Avenue South
New 12-inch water main

West River Street Well &
Pump Station

Lake Wildwood
Pratt Pond
Mill Pond
Taft Pond
Goss Pond
Zachary Pond
Fiske Millpond

BIRCH ROAD
SOUTHBORO ROAD
WESTBORO ROAD
PARK ROAD
OAK KNOLL LANE
GRAFTON ROAD
ORCHARD STREET
NICKORY LANE
NORTH STREET
MECHANIC STREET
EAMES LANE
DEAN POND ROAD
OLD HOPKINTON SPRING ROAD
SWAMP ROAD
BRIDGE ROAD
WHITE HALL ROAD
STEARNS ROAD
THAYER STREET
FOREST ROAD
PARK BY PASS
GRAVEL BET ROAD
HOPKINTON ROAD
WALNUT STREET
EAST STREET
GORE ROAD
FOWLER STREET
PRATT HILL ROAD
JAMES ROAD
ELM STREET
TAFT STREET
GORE MILL LANE
KIWANIS BEACH ROAD
ROCKWOOD LANE
MEADOW DRIVE
WILDWOOD AVENUE
WEST MAIN STREET
JONATHAN'S WAY
NATHANIEL WAY
EPHRAIM'S WAY
STODDARD STREET
NORTH MAIN STREET
RIVER STREET
HIGH STREET
CHURCH STREET
SCHOOL STREET
WARREN STREET
CHRISTIAN HILL ROAD
PEARL STREET
WHITNEY LANE
HAZELTINE STREET
NELSON STREET
MAIN STREET
BROOKS STREET
PICCADILLY STREET
WILLIAMS STREET
MYRTLE WAY
HARTFORD AVENUE NORTH
ISKE AVENUE
RUSSELL AVENUE
ARM STREET
RAILROAD AVENUE
DEPOT STREET
HARTFORD AVENUE
STAGECOACH ROAD
WARREN ROAD
BOUTHIETTE ROAD
VERNON STREET
GROVE STREET
MILFORD STREET
FISKE MILL ROAD
POND STREET
TYLER ROAD
GLADYS ROAD
PROSPECT STREET
GAMA STREET
WOOD STREET
FLORENCE CIRCLE
KNOWLTON CIRCLE
MAPLE AVENUE
PLAIN STREET
CENTERBROOK WAY
HENRY'S PATH
JOSIAH DRIVE
WEST RIVER STREET
PEASE ROAD
OLD CEMETERY ROAD
WALKER DRIVE
GLENVIEW STREET
PIERCE LANE
GLEN AVENUE
PLEASANT STREET
RIVER ROAD
WEST RIVER STREET
SOUTH STREET
PLUMPLEY ROAD
CHESTNUT STREET
SADLER ROAD
FARRAR ROAD
GOSS POND ROAD
GREEN LANE
BROUSSEAU DRIVE
BROOKSIDE STREET
SHORE DRIVE
MISCOE HILL ROAD
PINE STREET
JUNIPER ROAD
OAK DRIVE

Legend

- Hydraulic Improvement
- Maximum Service Area

Water Main Diameter

- 4-inch or smaller
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- 16-inch

Hydraulic Improvements
Upton, Massachusetts

TATA & HOWARD
Water and Wastewater Consultants

Approximate Scale: 1" = 1,000'
June 2011

Appendix E

N

HOPKINTON

GRAFTON

NORTHBRIDGE

HOPEDALE

MENDON

North Street
Booster Pump Station

Pratt Hill Water Storage Tank

Pearl Street Water Storage Tank

Glen Avenue Well Field
& Pump Station

Grafton Water District
Interconnection

West River Street Well &
Pump Station

RIDGE ROAD
SOUTHBORO ROAD
WESTBORO ROAD
PARK ROAD
OAK KNOLL LANE
GRAFTON ROAD
ORCHARD STREET
HICKORY LANE
NORTH STREET
MECHANIC STREET
EAMES LANE
DEAN POND ROAD
OLD HOPKINGTON SPRING ROAD
SWAMP ROAD
BRIDGE ROAD
WHITE HALL ROAD
STEARNS ROAD
THAYER STREET
FOREST ROAD
BARK BY PASS
GRAVEL HIT ROAD
HOPKINTON ROAD
GORE ROAD
WALNUT STREET
EAST STREET
FOWLER STREET
PRATT HILL ROAD
JAMES ROAD
OLD GRAFTON ROAD
MEADOW DRIVE
WILDWOOD AVENUE
WEST MAIN STREET
Lake Wildwood
JONATHAN'S WAY
EBENEZER'S WAY
NATHANIEL WAY
STODDARD STREET
MAIN STREET
RIVER STREET
HIGH STREET
CHURCH STREET
SCHOOL STREET
WARREN STREET
Pratt Pond
Mill Pond
CIDER MILL LANE
KOMANS BEACH ROAD
EAST STREET
TAFT STREET
BRIARWOOD LANE
CHRISTIAN HILL ROAD
WHITNEY LANE
HAZELTINE STREET
NELSON STREET
BROOKS STREET
PICCADILLY STREET
MILFORD STREET
FISKE MILL ROAD
POND STREET
TYLER ROAD
CHAPIN ROAD
Fiske Millpond
PROSPECT STREET
GABLE STREET
WOOD STREET
GLENVIEW STREET
WALKER DRIVE
CHESTNUT STREET
MENDON STREET
JESSE AVENUE
WILLIAM STREET
WHITFORD AVENUE NORTH
WHITFORD AVENUE
ROAD AVENUE
WARREN ROAD
BOLSHIETTE ROAD
FLORENCE CIRCLE
KNOWLTON CIRCLE
PLAIN STREET
CENTERBROOK WAY
MAPLE AVENUE
HENRY'S PATH
JOSIAH DRIVE
STAGECOACH ROAD
ROCKDALE HILL CIRCLE
Zachary Pond
PIERCE LANE
GLEN AVENUE
PLEASANT STREET
RUTLEDGE ROAD
WEST RIVER STREET
SOUTH STREET
PLUMBLY ROAD
SADLER ROAD
FARRAR ROAD
OAK DRIVE
GOSS POND ROAD
GREEN LANE
BROUSSEAU DRIVE
Goss Pond
BROOKSIDE STREET
Taft Pond
SHORE DRIVE
MISCOE HILL ROAD
JUNIPER ROAD
PINE STREET

Legend

- Critical Component Area
- School
- Medical Facility
- Miscellaneous

Water Main Diameter

- 4-Inch or Smaller
- 6-Inch
- 8-Inch
- 10-Inch
- 12-Inch
- 16-Inch

Critical Components Map
Upton, Massachusetts

TATA & HOWARD
Water and Wastewater Consultants

Approximate Scale: 1" = 1,000'
June 2011

Appendix F

N

HOPKINTON

GRAFTON

NORTHBRIDGE

HOPEDALE

MENDON

North Street
Booster Pump Station

Pratt Hill Water Storage Tank

Pearl Street Water Storage Tank

Glen Avenue Well Field
& Pump Station

Grafton Water District
Interconnection

West River Street Well &
Pump Station

RIDGE ROAD
SOUTHBORO ROAD
WESTBORO ROAD
PARK ROAD
WHITE HALL ROAD
OAK KNOLL LANE
GRAFTON ROAD
ORCHARD STREET
NORTH STREET
HICKORY LANE
MECHANIC STREET
EAMES LANE
DEAN POND ROAD
OLD HOPKINTON SPRING ROAD
SWAMP ROAD
BRIDGE ROAD
STEARNS ROAD
THAYER STREET
FOREST ROAD
PARK BY PASS
GOBLE ROAD
GRAVEL BIT ROAD
HOPKINTON ROAD
WALNUT STREET
EAST STREET
FOWLER STREET
PRATT HILL ROAD
JAMES ROAD
OLD GRAFTON ROAD
MEADOW DRIVE
WILDWOOD AVENUE
JONATHANS WAY
NATHANIEL WAY
EPHRAIMS WAY
Lake Wildwood
WEST MAIN STREET
MIDDLEWAY
WILLIAMS STREET
Pratt Pond
CIDER MILL LANE
KINGS BEACH ROAD
FLAGG STREET
TAFT STREET
BRIARWOOD LANE
STODDARD STREET
RIVER STREET
NORTH MAIN STREET
HIGH STREET
CHURCH STREET
SCHOOL STREET
WARREN STREET
Mill Pond
CHRISTIAN HILL ROAD
PEARL STREET
WHITNEY LANE
HAZELDINE STREET
NELSON STREET
MAIN STREET
BROOKS STREET
PICCADILLY STREET
MILFORD STREET
FISKE MILL ROAD
POND STREET
TYLER ROAD
CARPENTER ROAD
PROSPECT STREET
Fiske Millpond
HAZELDINE AVENUE NORTH
HAZELDINE AVENUE
RUSSELL AVENUE
ARM STREET AVENUE
BROAD AVENUE
DROOT STREET
HARTFORD AVENUE
STAGECOACH ROAD
PEACOCK HILL CIRCLE
FLORENCE CIRCLE
KNOWLTON CIRCLE
MARLIN AVENUE
WARREN ROAD
BOUTHIETTE ROAD
PLAIN STREET
CENTERBROOK WAY
GABLE STREET
WOOD STREET
GLENVIEW STREET
WALKER DRIVE
Zachery Pond
HENRY'S PATH
JOSHUA'S WAY
PIERCE LANE
GLEN AVENUE
PLEASANT STREET
WEST RIVER STREET
ELM ROAD
OLD CEMETERY ROAD
BUTLER ROAD
WEST RIVER STREET
SOUTH STREET
PLUMBLEY ROAD
SADLER ROAD
FARRAR ROAD
CHESTNUT STREET
SHORE DRIVE
Taft Pond
GOSS POND ROAD
BROOKSIDE STREET
MISCOE HILL ROAD
GREEN LANE
BROUSSEAU DRIVE
Goss Pond
RANDEE ROAD
PINE STREET
OAK DRIVE

Legend

Asset Management Rating

Good-Excellent

Fair-Good

Poor-Fair

Asset Management Rating
Upton, Massachusetts

TATA & HOWARD
Water and Wastewater Consultants

Approximate Scale: 1" = 1,000'
June 2011

Appendix G

N

North Street
Booster Pump Station

Pratt Hill Water Storage Tank

Pearl Street Water Storage Tank

Glen Avenue Well Field
& Pump Station

Grafton Water District
Interconnection

West River Street Well &
Pump Station

HOPKINTON

GRAFTON

NORTHBRIDGE

HOPEDALE

MENDON

RIDGE ROAD
SOUTHBORO ROAD
WESTBORO ROAD
PARK ROAD
WHITE HALL ROAD
OAK KNOLL LANE
GRAFTON ROAD
ORCHARD STREET
NORTH STREET
HICKORY LANE
MECHANIC STREET
DEAN POND ROAD
OLD HOPKINGTON SPRING ROAD
SWAMP ROAD
BRIDGE ROAD
EAMES LANE
STEARNS ROAD
THAYER STREET
FOREST ROAD
PARK BY PASS
GOBLE ROAD
GRAVEL BIT ROAD
HOPKINTON ROAD
WALNUT STREET
EAST STREET
FOWLER STREET
PRATT HILL ROAD
JAMES ROAD
CIDER MILL LANE
ELM STREET
TAFT STREET
KINNANS BEACH ROAD
BRIARWOOD LANE
CHRISTIAN HILL ROAD
OLD GRAFTON ROAD
WILDWOOD AVENUE
WESTMAIN STREET
Lake Wildwood
Pratt Pond
Mill Pond
HIGH STREET
CHURCH STREET
MAIN STREET
WARREN STREET
TOWN HALL ROAD
FISKE AVENUE
PICCADILLY STREET
MILLFORD STREET
FISKE MILL ROAD
TYLER ROAD
POND STREET
PROSPECT STREET
GABLE STREET
WOOD STREET
GLENVIEW STREET
WALKER DRIVE
STAGECOACH ROAD
LAWRENCE CIRCLE
ZACHERY'S PATH
Zachery Pond
PEASE ROAD
OLD CEMETERY ROAD
PIERCE LANE
GLEN AVENUE
PLEASANT STREET
BUTLER ROAD
WEST RIVER STREET
SOUTH STREET
PLUMBLEY ROAD
SADLER ROAD
FARRAR ROAD
CHESTNUT STREET
GOSS POND ROAD
GREEN LANE
BROUSSEAU DRIVE
Goss Pond
BROOKSIDE STREET
Taft Pond
SHORE DRIVE
MISCOE HILL ROAD
JUNIPER ROAD
PINE STREET
OAK DRIVE

Legend

- Hydraulic Improvement
- Critical Component Area
- Other
- Schools
- Medical Facilities

Asset Management Rating

- Good - Excellent
- Fair - Good
- Poor - Fair

Three Circles Integration Map
Upton, Massachusetts

TATA & HOWARD
Water and Wastewater Consultants

Approximate Scale: 1" = 1,000'
June 2011

Appendix H

N

HOPKINTON

GRAFTON

NORTHBRIDGE

HOPEDALE

MENDON

North Street
Booster Pump Station

Pratt Hill Water Storage Tank

Pearl Street Water Storage Tank

8. Meadow Drive
New 8-inch water main

4. Hartford Avenue North
New 8-inch water main

7. Depot Street
New 8-inch water main

6. Station Street
New 8-inch water main

5. Plain Street
New 8-inch water main

3. Mendon Street
New 12-inch water main

1a.Glen Avenue Wellfield Rehabilitation

Glen Avenue Well Field
& Pump Station

Grafton Water District
Interconnection

2a. Glen Avenue, Cross Counrty Main & Farm Street
New 12-inch & 8-inch water main

2b. Hartford Avenue South & Farm Street
New 12-inch & 8-inch water main

West River Street Well &
Pump Station

1b. Richard Property Wellfield
New 12-inch & 8-inch water main

Lake Wildwood
Pratt Pond
Mill Pond
Zachary Pond
Goss Pond
Taft Pond
Fiske Millpond

RIDGE ROAD
SOUTHBORO ROAD
WESTBORO ROAD
PARK ROAD
WHITE HALL ROAD
OAK KNOLL LANE
GRAFTON ROAD
ORCHARD STREET
NORTH STREET
HICKORY LANE
MECHANIC STREET
EAMES LANE
OLD HOPKINTON SPRING ROAD
SWAMP ROAD
BRIDGE ROAD
DEAN POND ROAD
STEARNS ROAD
THAYER STREET
FOREST ROAD
PARK BY PASS
GRAVEL BIT ROAD
HOPKINTON ROAD
WALNUT STREET
EAST STREET
GORE ROAD
FOWLER STREET
PRATT HILL ROAD
JAMES ROAD
OLD GRAFTON ROAD
MEADOW DRIVE
JONATHAN'S WAY
EPHRAIM'S WAY
NATHANIEL WAY
WEST MAIN STREET
WILLIAMS STREET
MERRIAM WAY
HIGH STREET
CHURCH STREET
WARREN STREET
HARTFORD AVENUE NORTH
WHITNEY LANE
HAZELTINE STREET
PINE AVENUE
NELSON STREET
SCHOOL STREET
MAIN STREET
STODDARD STREET
NORTH MAIN STREET
RIVER STREET
CIDER MILL LANE
KWANIS BEACH ROAD
TAFT STREET
FLAG STREET
BRIARWOOD LANE
CHRISTIAN HILL ROAD
PEARL STREET
BROOKS STREET
PICCADILLY STREET
PLEASANT STREET
RUSSELL AVENUE
MAPLE AVENUE
HARTFORD AVENUE
DEPOT STREET
FLORENCE CIRCLE
WARREN ROAD
STATION STREET
BOLTHETTE ROAD
GROVE STREET
PLAIN STREET
CENTERBROOK WAY
FISKE MILL ROAD
POND STREET
TYLER ROAD
PLAIN ROAD
PROSPECT STREET
GABLE STREET
WOOD STREET
MILFORD STREET
GLENVIEW STREET
WALKER DRIVE
JOSIAH DRIVE
MAPLE AVENUE
PIERCE LANE
GLEN AVENUE
PLEASANT STREET
WEST RIVER STREET
PEASE ROAD
OLD CEMETERY ROAD
RIVER ROAD
SOUTH STREET
PLUMBLEY ROAD
SADLER ROAD
JABRAB ROAD
CHESTNUT STREET
OAK DRIVE
GOSS POND ROAD
GREEN LANE
BROUSSEAU DRIVE
BROOKSIDE STREET
SHORE DRIVE
MISCOE HILL ROAD
PINE STREET
JUNIPER ROAD

Legend

- Water Main
- Phase I Improvement
- Phase II Improvement
- Phase III Improvement

See Table No. 7-6 for Improvement No. 9

Recommended Improvements
Upton, Massachusetts

TATA & HOWARD
Water and Wastewater Consultants

Approximate Scale: 1" = 1,000'
June 2011

www.tataandhoward.com

MAIN OFFICE
67 Forest Street
Marlborough, MA 01752
T. 508-303-9400

OTHER OFFICES
Goodyear, AZ Nashua, NH
Lakeville, MA Portland, ME
Meriden, CT

TATA & HOWARD