

The Metropolitan Area Master Water Supply Plan includes community water supply profiles for each community that contain water supply issues identified through the availability assessment described in chapter 5 of the Master Water Supply Plan. These issues will need to be addressed as part of water supply development to ensure the sustainability of the region's water resources. When a water supply system expansion is proposed, requiring new or updated permits, or when water supply or wellhead protection plans are prepared or updated, water suppliers should address issues identified on their profiles in one of the following ways:

- 1. Acknowledgement that at-risk water supply sources will not be used to meet additional future demand.** "At-risk" refers to water supply sources identified as having one or more issues in a community profile. Development of a water supply source *without* any identified water availability issues may be considered an appropriate response. Because the analysis conducted for the development of this plan only evaluated traditional sources, analysis of alternative sources may be necessary prior to use.
- 2. Demonstration that use of the at-risk water supply source will not result in the issue identified in the community profile.** If accepted by the Minnesota Department of Natural Resources (DNR), past or current local studies demonstrating that use of a source will not result in the issue identified in a community's profile will be considered an appropriate response. Study results will be incorporated into the regional availability analysis and included in updates to the master plan.
- 3. Development of the at-risk water supply source with a staged impact mitigation plan based on the threshold responses provided in this appendix.** Threshold responses contained in this appendix were developed by the Metropolitan Council, Minnesota Department of Natural Resources (DNR), and Minnesota Department of Health (MDH). They outline responses to issues contained in the community profiles that communities can make if they chose to continue using a source with an identified issue. The responses reflect existing water appropriation permit and water supply plan conditions applied under similar circumstances around the state.

Several communities are addressing issues identified in their profiles as part of existing water appropriation permits or management activities. These efforts may meet the actions listed in this appendix and may be deemed an acceptable approach by the DNR.

Minimum Actions for all Water Suppliers:

1. Meet water use benchmarks outlined in the local water supply plan template or implement conservation programs targeted at reaching the water use benchmarks.
2. Measure water levels at least monthly at existing production and observation wells from October through April and at least weekly from May through September.*
3. Submit water level data to the to the DNR using the forms provided online at www.dnr.state.mn.us/waters/watermgmt_section/appropriations/permits.html
4. Recommend that stormwater best management practices are selected which improve water quality and increase infiltration rates when reviewing local development plans. Areas delineated as vulnerable or highly vulnerable drinking water supply management areas through the MDH wellhead protection program may require special land use considerations.

*Water level measurements taken from production wells should, if possible, represent static, not pumping, conditions. Where automated water level measurements are collected by a datalogger, measurement frequency should be adjusted to capture the full amplitude of water level variation during both pumping and static conditions. If a pressure transducer is used to measure water level, barometric pressure should be measured concurrently.

Water Supply Issue: Potential for well interference	
Threshold	Response
Predicted > 20 foot decline in aquifer water levels by 2050	<ul style="list-style-type: none"> ▪ Through the review of plans, land use planning or other means, encourage a design of non-municipal wells so that the well and pump depth account for future regional lowering of aquifer water levels.
Predicted > 20 foot decline in aquifer water levels by 2030	<ul style="list-style-type: none"> ▪ Develop an inventory of all active domestic and public water supply wells within the community. For each well, document well depth, diameter, non-pumping and pumping water levels, quality, well construction details. ▪ Develop an inventory of inactive, unsealed wells that may serve as future observation wells.
Documented well interference	<ul style="list-style-type: none"> ▪ Take actions outlined in Minnesota Rules (6115.0730).

*Water level readings taken from production wells must meet standards intended to ensure that static, not pumping, water levels are recorded. Where automated water level measurements are collected by a datalogger, measurement frequency should be adjusted to capture the full amplitude of water level variation during both pumping and static conditions and monthly manual measurements should be taken to for datalogger calibration.

** If an observation well (or wells) do not currently exist, work with DNR to locate and drill a new well or convert an existing abandoned well

Water Supply Issue: Potential for significant decline in aquifer water levels	
Threshold	Response
Predicted > 50% decline in available head by 2050	<ul style="list-style-type: none"> ▪ Develop impact mitigation approaches such as strategic well placement away from known hydrologic boundaries. ▪ Evaluate potential water supply alternatives available to meet future demand. ▪ Develop a monitoring program that includes: <ul style="list-style-type: none"> - Weekly or more frequent measurement of water levels and/or pumping rates in existing production wells*, and - Weekly or more frequent measurement of water levels in at least one observation well near the well field**.
Predicted > 50% decline in available head by 2030	<ul style="list-style-type: none"> ▪ Develop impact mitigation approaches such as strategic well placement and pumping schedules. ▪ Evaluate potential water supply alternatives available to meet future demand. ▪ Implement a monitoring program that includes: <ul style="list-style-type: none"> - Daily or more frequent measurement of water levels and/or pumping rates in existing production wells. Use of an automated datalogger is recommended. - Daily or more frequent measurement of water levels in at least one observation well near the well field and in at least one observation well away from the well field**. Use of automated dataloggers is recommended.

(Continued on the next page)

*Water level readings taken from production wells must meet standards intended to ensure that static, not pumping, water levels are recorded. Where automated water level measurements are collected by a datalogger, measurement frequency should be adjusted to capture the full amplitude of water level variation during both pumping and static conditions and monthly manual measurements should be taken to for datalogger calibration.

** If an observation well (or wells) do not currently exist, work with DNR to locate and drill a new well or convert an existing abandoned well

Water Supply Issue: Potential for significant decline in aquifer water levels	
Measured > 50% decline in confined aquifer available head <i>or</i> Measured continuing decline in unconfined aquifer head	<ul style="list-style-type: none"> ▪ Implement mitigation approaches such as strategic well placement and pumping management. ▪ Implement aggressive demand management measures to minimize additional drawdowns. ▪ Identify alternative sources to meet future demand and preparation of a timeline for developing the source(s) should declines continue. ▪ Implement a monitoring program that includes: <ul style="list-style-type: none"> - Multiple daily measurement of water levels and/or pumping rates in existing production wells*. Use of an automated datalogger is recommended. - Multiple daily measurement of water levels in at least one observation well near the well field and in at least one observation well away from the well field **. Use of automated dataloggers is recommended.
Measured > 75% decline of available head	<ul style="list-style-type: none"> ▪ Continue monitoring and demand management efforts. ▪ Cease appropriation from the aquifer or minimize pumping to such a degree that water levels stop declining. ▪ Use an alternative source to meet future demand, if needed.

*Water level readings taken from production wells must meet standards intended to ensure that static, not pumping, water levels are recorded. Where automated water level measurements are collected by a datalogger, measurement frequency should be adjusted to capture the full amplitude of water level variation during both pumping and static conditions and monthly manual measurements should be taken to for datalogger calibration.

** If an observation well (or wells) do not currently exist, work with DNR to locate and drill a new well or convert an existing abandoned well

Water Supply Issue: Potential for impacts of groundwater pumping on surface water features	
Threshold	Response
Predicted > 1 meter decline in surficial aquifer water levels by 2050	<ul style="list-style-type: none"> ▪ Identify specific at-risk surface water resources in consultation with the DNR. ▪ Implement a monitoring program that includes: <ul style="list-style-type: none"> - Weekly or more frequent measurement of water levels and/or pumping rates in existing production wells - Weekly or more frequent measurement of water levels in at least one observation well or well nest near the at-risk surface water feature(s)**.
Predicted > 1 meter decline in surficial aquifer water levels by 2030	<ul style="list-style-type: none"> ▪ Identify specific at-risk surface water resources and development of resource protection thresholds in consultation with the DNR. ▪ Implement a monitoring program that includes: <ul style="list-style-type: none"> - Multiple daily measurement of water levels and pumping rates in existing production wells - Multiple daily measurement of water levels in at least one observation well or well nest near the at-risk surface water feature(s)**. - Multiple daily measurement of water levels at the at-risk surface water feature(s).
Measured exceedance of resource protection thresholds developed in cooperation with the DNR	<ul style="list-style-type: none"> ▪ Implement more aggressive demand management measures to minimize additional drawdowns. ▪ Continue monitoring efforts. ▪ Cease appropriation from the aquifer or minimize pumping to such a degree that water resource thresholds are no longer exceeded. ▪ Use an alternative source(s) to meet future demand.

*Water level readings taken from production wells must meet standards intended to ensure that static, not pumping, water levels are recorded. Where automated water level measurements are collected by a datalogger, measurement frequency should be adjusted to capture the full amplitude of water level variation during both pumping and static conditions and monthly manual measurements should be taken to for datalogger calibration.

** If an observation well (or wells) do not currently exist, work with DNR to locate and drill a new well or convert an existing abandoned well

Water Supply Issue: Potential for impacts to state protected trout habitat or calcareous fen	
Threshold	Response
Trout stream or calcareous fen located within 1 mile of community	<ul style="list-style-type: none"> ▪ Conduct evaluation, if not already done, to determine the likelihood of adverse impacts from withdrawals on trout stream or calcareous fen. ▪ If potential for impact exists, implement a monitoring program that includes: <ul style="list-style-type: none"> - Weekly or more frequent measurement of water levels and/or pumping rates in existing production wells - Weekly or more frequent measurement of water levels in at least one observation well or well nest between production well and trout stream or calcareous fen (sentinel well)**.
Measured > 1 meter decline in observation well between production well and trout stream or calcareous fen (sentinel well) correlated to pumping	<ul style="list-style-type: none"> ▪ Implement mitigation approaches such as strategic well placement and pumping management. ▪ Implement more aggressive demand management measures to minimize additional drawdowns. ▪ Identify viable alternative sources to meet future demand and preparation of a timeline for developing the source(s) should declines continue. ▪ Implement a monitoring program that includes: <ul style="list-style-type: none"> - Multiple daily measurement of water levels and pumping rates in existing production wells - Multiple daily measurement of water levels in at least one observation well or well nest between the well field and trout stream or calcareous fen and in at least one observation well adjacent to the trout stream and calcareous fen**. <p style="text-align: right;"><i>(Continued on the next page)</i></p>

*Water level readings taken from production wells must meet standards intended to ensure that static, not pumping, water levels are recorded. Where automated water level measurements are collected by a datalogger, measurement frequency should be adjusted to capture the full amplitude of water level variation during both pumping and static conditions and monthly manual measurements should be taken to for datalogger calibration.

** If an observation well (or wells) do not currently exist, work with DNR to locate and drill a new well or convert an existing abandoned well

Water Supply Issue: Potential for impacts to state protected trout habitat or calcareous fen

Measured decline in observation well adjacent to trout stream or calcareous fen or exceedance of resource protection thresholds.

- Implement aggressive demand management measures to minimize additional drawdowns.
- Continue monitoring efforts.
- Cease appropriation from the aquifer or minimize pumping to such a degree that water resource thresholds are no longer exceeded.
- Use an alternative source(s) to meet future demand, if needed.

*Water level readings taken from production wells must meet standards intended to ensure that static, not pumping, water levels are recorded. Where automated water level measurements are collected by a datalogger, measurement frequency should be adjusted to capture the full amplitude of water level variation during both pumping and static conditions and monthly manual measurements should be taken to for datalogger calibration.

** If an observation well (or wells) do not currently exist, work with DNR to locate and drill a new well or convert an existing abandoned well

Water Supply Issue: Significant uncertainty regarding aquifer extent and productivity	
Threshold	Response
<p>Quaternary and Franconia-Ironton-Galesville aquifers are the only regionally productive aquifers available in the community,</p> <p><i>and</i></p> <p>No local aquifer tests have been conducted in the primary aquifer(s) utilized in the community</p>	<ul style="list-style-type: none"> ▪ Develop or update geologic maps through a cooperative effort by the region, communities, the Minnesota Geological Survey and the DNR. The DNR County Atlas-Regional Assessment Program is an established mechanism for this type of work. ▪ Through a cooperative effort with the DNR, MDH and others, collect aquifer characteristic information through aquifer tests of adequate duration to assess hydrologic boundaries, groundwater -surface water interaction, and interaction with other aquifers.

*Water level readings taken from production wells must meet standards intended to ensure that static, not pumping, water levels are recorded. Where automated water level measurements are collected by a datalogger, measurement frequency should be adjusted to capture the full amplitude of water level variation during both pumping and static conditions and monthly manual measurements should be taken to for datalogger calibration.

** If an observation well (or wells) do not currently exist, work with DNR to locate and drill a new well or convert an existing abandoned well

Issue: Known groundwater contamination	
Threshold	Response
Contamination detected in community system or aquifer that serves a community system	<ul style="list-style-type: none"> ▪ Cooperate with the MDH to conduct enhanced water quality monitoring. ▪ Implement treatment processes to meet Safe Drinking Water Act requirements.
MDH establishes Special Well Construction Area or adjust boundaries of existing areas (in accordance to M.R. part 4725.3650)	<ul style="list-style-type: none"> ▪ MDH continues enhanced monitoring. ▪ Meet the requirements of the Special Well Construction Area regarding the installation of new wells and the reconstruction of existing wells. ▪ MDH may order the sealing or reconstruction of wells and borings, in accordance with Minnesota Statutes, Sections 103I.301 and 103I.315. ▪ Implement treatment processes that meet Safe Drinking Water Act requirements. ▪ Manage pumping, if needed, to better control the extent and magnitude of contaminant plume.

*Water level readings taken from production wells must meet standards intended to ensure that static, not pumping, water levels are recorded. Where automated water level measurements are collected by a datalogger, measurement frequency should be adjusted to capture the full amplitude of water level variation during both pumping and static conditions and monthly manual measurements should be taken to for datalogger calibration.

** If an observation well (or wells) do not currently exist, work with DNR to locate and drill a new well or convert an existing abandoned well

Water Supply Issue: Significant contamination vulnerability	
Threshold	Response
<p>The MDH designates all or part of a wellhead protection area as vulnerable to potential sources of contamination.</p>	<ul style="list-style-type: none"> ▪ Develop measures to mitigate public health risks due to potential contamination sources, and include these measures in the community's wellhead protection plan as required under Minnesota Rules (4720.5250). ▪ Develop a plan in cooperation with the MDH to increase monitoring for contaminants regulated under the federal Safe Drinking Water Act. ▪ Request support, if needed, from federal, state, and local governments regarding management of potential contamination sources.
<p>The MDH designates an area as exhibiting a high potential for nitrate nitrogen contamination.</p>	<ul style="list-style-type: none"> ▪ Address point sources and non-point impacts of nitrate contamination when siting new public water supply wells. ▪ Increase the testing frequency for community water supply wells, if required by the MDH, when nitrate levels exceed a background level of 3 ppm. ▪ Address existing or new potential sources of nitrate nitrogen in new or updated wellhead protection plans as required under Minnesota Rules (4720.5250).
<p>The Minnesota Department of Health designates the aquifer as a likely source of arsenic, radium, or other naturally occurring contaminants.</p>	<ul style="list-style-type: none"> ▪ Address the likelihood that treatment for naturally occurring contaminants is needed to meet drinking water standards when planning for new water supply wells. ▪ Use an alternative source to meet future demand, if treatment is not effective in meeting federal or state drinking water limits.

*Water level readings taken from production wells must meet standards intended to ensure that static, not pumping, water levels are recorded. Where automated water level measurements are collected by a datalogger, measurement frequency should be adjusted to capture the full amplitude of water level variation during both pumping and static conditions and monthly manual measurements should be taken to for datalogger calibration.

** If an observation well (or wells) do not currently exist, work with DNR to locate and drill a new well or convert an existing abandoned well