

Office of the Auditor General  
Performance Audit Report

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**Aggregate Quality Process**  
Michigan Department of Transportation

December 2022

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The auditor general shall conduct post audits of financial transactions and accounts of the state and of all branches, departments, offices, boards, commissions, agencies, authorities and institutions of the state established by this constitution or by law, and performance post audits thereof.

The auditor general may make investigations pertinent to the conduct of audits.

*Article IV, Section 53 of the Michigan Constitution*

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# OAG

Office of the Auditor General

## Report Summary

### *Performance Audit*

### *Aggregate Quality Process*

### *Michigan Department of Transportation (MDOT)*

**Report Number:**  
**591-0420-21**

**Released:**  
**December 2022**

MDOT's Bureau of Field Services, Construction Field Services Division, regional offices, and transportation service centers are responsible for ensuring the quality of aggregate material used during highway construction projects. Aggregate is a substance composed of mineral crystals or mineral rock fragments used in pavement. MDOT procedures require aggregate to be quality assurance tested at established frequencies (see Exhibit 1). As of January 28, 2021, MDOT had 613 aggregate suppliers. Aggregate suppliers can apply to become prequalified to reduce required testing frequency. To become prequalified, a supplier must have a quality control plan, internal or contracted quality control testing, and qualified staff.

| Audit Objective  |                    |                      | Conclusion                  |
|--|--------------------|----------------------|-----------------------------|
| Objective 1: To assess the sufficiency of MDOT's efforts to ensure aggregate quality.  |                    |                      | Sufficient, with exceptions |
| Findings Related to This Audit Objective   | Material Condition | Reportable Condition | Agency Preliminary Response |
| MDOT did not retain weekly shipment summaries for 18 (45%) of 40 prequalified aggregate suppliers ( <a href="#">Finding 1</a> ).   | X                  |                      | Agrees                      |
| MDOT did not test non-prequalified aggregate at the required frequency for 9 (18%) of 50 construction projects, and in 12 (29%) of 41 construction projects, MDOT did not perform physical property testing on the material ( <a href="#">Finding 2</a> ). |                    | X                    | Agrees                      |

| Audit Objective  | Conclusion           |
|--|----------------------|
| Objective 2: To assess the effectiveness of MDOT's efforts to administer the Aggregate Supplier Program. | Moderately effective |

| Findings Related to This Audit Objective  | Material Condition | Reportable Condition | Agency Preliminary Response |
|---|--------------------|----------------------|-----------------------------|
| For 36 (90%) of 40 prequalified aggregate supplier quality control laboratories and 10 (59%) of 17 quality assurance laboratories, MDOT did not have required biennial inspections ( <u>Finding 3</u> ).                                | X                  |                      | Agrees                      |
| For 10 (71%) of 14 prequalified aggregate suppliers, MDOT did not have an initial laboratory inspection and for 7 (50%) of 14 quality control plans, the prequalified supplier did not have the required elements ( <u>Finding 4</u> ). | X                  |                      | Agrees                      |
| MDOT did not perform Independent Assurance Tests on aggregate technicians for 6 (35%) of 17 construction projects using non-prequalified aggregate materials ( <u>Finding 5</u> ).  |                    | X                    | Agrees                      |

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# OAG

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**Doug A. Ringler, CPA, CIA**  
Auditor General

December 21, 2022

Mr. Todd Wyett, Chair  
State Transportation Commission  
and  
Paul C. Ajegba, PE, Director  
Michigan Department of Transportation  
Murray D. Van Wagoner Building  
Lansing, Michigan

Dear Mr. Wyett and Mr. Ajegba:

This is our performance audit report on the Aggregate Quality Process, Michigan Department of Transportation.

We organize our findings and observations by audit objective. Your agency provided preliminary responses to the recommendations at the end of our fieldwork. The *Michigan Compiled Laws* and administrative procedures require an audited agency to develop a plan to comply with the recommendations and to submit it to the State Budget Office upon completion of an audit. Within 30 days of receipt, the Office of Internal Audit Services, State Budget Office, is required to review the plan and either accept the plan as final or contact the agency to take additional steps to finalize the plan.

We appreciate the courtesy and cooperation extended to us during this audit.

Sincerely,

Doug Ringler  
Auditor General



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# AUDIT OBJECTIVES, CONCLUSIONS, FINDINGS, AND OBSERVATIONS

# ENSURING AGGREGATE QUALITY

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## BACKGROUND

The Michigan Department of Transportation's (MDOT's) Bureau of Field Services, Construction Field Services (CFS) Division, regional offices, and transportation service centers share responsibility for ensuring the quality and specification of aggregate\* material used during highway construction projects. Aggregate is a substance composed of mineral crystals or mineral rock fragments used in pavement.

Each aggregate supplier must meet initial quality assurance and physical property tests. For the initial quality tests, MDOT obtains samples from the source pit and submits them to CFS aggregate laboratory for testing. During use in a project, MDOT requires non-prequalified aggregate to be quality assurance tested at its established frequencies (see Exhibit 1).

To reduce required quality assurance testing frequency, aggregate suppliers can become prequalified. Prequalified suppliers must submit weekly shipping summaries to MDOT regional offices and the Aggregate Quality Unit (AQU) within the CFS Division. MDOT requires the regional offices to track the amount shipped by the prequalified suppliers and ensure the aggregate is quality assurance tested at its established frequencies (see Exhibit 1).

CFS is required to biennially perform inspections of quality assurance and prequalified suppliers' quality control laboratories.

## AUDIT OBJECTIVE

To assess the sufficiency of MDOT's efforts to ensure aggregate quality.

## CONCLUSION

Sufficient, with exceptions.

## FACTORS IMPACTING CONCLUSION

- For our site visits to three MDOT construction projects, we identified no deviations from the aggregate sampling process.
- MDOT completed initial physical property tests as required for all sampled prequalified aggregate supplier sources.
- Material condition\* related to the Prequalified Aggregate Supplier Program\* (PASP) (Finding 1).
- Reportable condition\* related to testing for non-prequalified aggregate sources (Finding 2).

\* See glossary at end of report for definition.

## FINDING 1

### Improvements needed to PASP.

Weekly shipment summaries were not retained for 18 (45%) of 40 prequalified suppliers.

MDOT did not establish sufficient internal control\* over PASP to ensure the prequalified aggregate supplier list is accurate and aggregate is tested at the proper frequency.

MDOT's Procedures for Aggregate Inspection Manual (Manual) requires prequalified suppliers to submit weekly summaries of aggregate material shipped, regardless of the amount, and requires regional offices to retain a copy of each prequalified supplier's weekly summaries for a minimum of five years. Suppliers must also document the quantities supplied to all MDOT and federally funded projects. The Manual also specifies the required quality assurance testing frequencies of aggregate supplied by prequalified suppliers.

Our review of 40 suppliers from MDOT's list of prequalified suppliers between October 1, 2018 and June 30, 2021 disclosed MDOT did not retain weekly summaries of aggregate material shipped for 18 (45%) of the 40 suppliers.

MDOT informed us 6 (33%) of the 18 suppliers were inactive and should have been removed from the prequalified supplier list. MDOT construction and material testing staff use the prequalified supplier list to determine required quality assurance testing frequencies. Not maintaining an accurate list of prequalified suppliers could result in aggregate not being tested at the required frequencies.

For the remaining 12 (67%) suppliers, we were unable to determine if MDOT completed the required quality assurance testing because of the missing weekly summaries.

The Manual did not include guidance for how or when to remove an aggregate supplier from PASP. Removal guidance could include reasons such as a supplier not complying with conditions of PASP, supplier inactive for a certain period of time, and supplier-requested removal from PASP. The lack of guidance may be the reason the 6 suppliers noted above were not removed from the list.

We consider this finding to be a material condition because of the number of exceptions identified and the potential negative impact on construction projects.

## RECOMMENDATION

We recommend that MDOT establish sufficient internal control over PASP to ensure the prequalified aggregate supplier list is accurate and aggregate is tested at the proper frequency.

\* See glossary at end of report for definition.

**AGENCY  
PRELIMINARY  
RESPONSE**

MDOT provided us with the following response:

*MDOT agrees with the recommendation. However, weekly summaries from prequalified aggregate suppliers are not the primary means for quality assurance testing. These summaries serve as a notice to testing staff of quantities shipped and that testing may be needed. Quality assurance testing is evaluated on a project basis and not on supplier shipment documentation. Lack of material testing is flagged at the project level prior to payment of respective work items.*

*In addition, MDOT has commenced implementation of a database and software solution titled AASHTOWare Project Construction and Materials (APCM) for managing construction work completed by contractors. APCM includes a module for aggregate quality assurance (QA) testing, which will provide a single unified repository for all testing-related information, and the department will implement aggregate material reporting to project and testing personnel. The APCM aggregate module is expected to be completed by May 1, 2023, and MDOT anticipates it will complete program-wide functionality, training, and implementation of the aggregate module by November 1, 2023.*

**AUDITOR'S  
COMMENTS TO  
AGENCY  
PRELIMINARY  
RESPONSE\***

MDOT states quality assurance testing is evaluated on a project basis; however, quality assurance testing for PASP suppliers is based on amounts (Exhibit 1) shipped from the supplier. Without the shipping summaries, MDOT cannot determine the amount of aggregate shipped by the PASP suppliers and the amount of subsequent quality assurance testing it should perform.

\* See glossary at end of report for definition.

## FINDING 2

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### Improved testing of non-prequalified aggregate sources needed.

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MDOT did not always ensure its staff or local agencies performed required testing for non-prequalified aggregate sources. Failure to perform required testing could increase the likelihood that the aggregate used in construction projects may not meet project specifications.

The Manual requires aggregate material from non-prequalified suppliers used in MDOT or federally funded projects undergo testing by MDOT or local agencies for project-specific acceptance according to standard frequencies based on aggregate type (see Exhibit 1). The Manual also requires that sources supplying dense-graded, open-graded, and coarse aggregates used in MDOT projects have a minimum of one Los Angeles (LA) Abrasion test\* every five years regardless of the quantity of material the source has produced during that time. An LA Abrasion test evaluates aggregate for resistance to abrasion.

We reviewed 50 MDOT construction projects awarded between October 1, 2018 and June 30, 2021 with aggregate used from at least one non-prequalified supplier. Our review disclosed:

- a. For 9 (18%) of the 50 projects, MDOT was unable to provide documentation to validate MDOT or a contracted third-party testing laboratory performed aggregate quality assurance testing at the required frequency, as follows:

| <u>Number of Missing Tests</u> | <u>Number of Projects</u> |
|--------------------------------|---------------------------|
| 1                              | 4                         |
| 2                              | 2                         |
| 3                              | 0                         |
| 4                              | 2                         |
| 5                              | 1                         |

MDOT informed us that, in some instances, region materials staff and project engineers did not have updated prequalified aggregate supplier lists and, therefore, applied decreased testing frequencies.

- b. For 12 (29%) of the 41 projects identified for aggregate physical property testing, MDOT did not conduct the required LA Abrasion tests within the required time period prior to accepting the material for the project.

MDOT informed us aggregate suppliers did not request compliance testing as required in the Manual, and as a result of staffing limitations, testing was not always performed.

\* See glossary at end of report for definition.

**RECOMMENDATION**

We recommend that MDOT ensure its staff or local agencies perform required testing for non-prequalified aggregate sources.

**AGENCY  
PRELIMINARY  
RESPONSE**

MDOT provided us with the following response:

*MDOT agrees with the recommendation. MDOT has commenced implementation of a database and software solution titled APCM for managing construction work completed by contractors. APCM includes a module for aggregate QA testing, which will provide a single unified repository for all testing-related information, and the department will implement aggregate material reporting to project and testing personnel. The APCM aggregate module is expected to be completed by May 1, 2023, and MDOT anticipates it will complete program-wide functionality, training, and implementation of the aggregate module by November 1, 2023.*

# ADMINISTERING THE AGGREGATE SUPPLIER PROGRAM

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## BACKGROUND

The MDOT Aggregate Supplier Program allows eligible suppliers the opportunity to provide material to both State and federally funded projects. Suppliers can apply to become prequalified. Prequalification in the Aggregate Supplier Program is a partnership between MDOT regional offices and suppliers, exchanging documented quality control and certified testing personnel by suppliers, for a reduction in acceptance testing and increased failing material resolution from AQU. To become prequalified, a supplier must have a quality control plan, internal or contracted quality control testing, and qualified staff.

Prior to May 27, 2021, CFS and MDOT regional office staff reviewed and approved the prequalified supplier applications, with final approval granted by CFS. Subsequently, review and approval of prequalified supplier applications became the sole responsibility of the MDOT regions. MDOT shifted the approval role to the regions because of resource limitations within CFS and to ensure timely program delivery.

MDOT employees and contractors who perform sampling and testing of aggregate are required to attain certification through the Michigan Certified Aggregate Technician\* (MCAT) Program. Certifications are valid for five years. MDOT also requires MCATs to pass an annual Independent Assurance Test (IAT).

## AUDIT OBJECTIVE

To assess the effectiveness\* of MDOT's efforts to administer the Aggregate Supplier Program.

## CONCLUSION

Moderately effective.

## FACTORS IMPACTING CONCLUSION

- All 14 sampled MDOT aggregate suppliers approved for prequalification submitted quality control plans and employed MCAT personnel.
- MDOT maintained an accurate IAT tracking database for aggregate technicians.
- All aggregate technicians performing quality assurance testing for the 40 sampled prequalified suppliers held appropriate MCAT certifications and completed and passed an annual IAT.

\* See glossary at end of report for definition.

- Two material conditions related to biennial laboratory inspections and ensuring suppliers meet PASP requirements (Findings 3 and 4).
- Reportable condition related to IATs for technicians performing quality assurance testing for non-prequalified aggregate materials (Finding 5).



### FINDING 3

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**Improvement needed  
over biennial  
laboratory  
inspections.**

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MDOT should improve its internal control to ensure all required quality assurance and prequalified aggregate suppliers' quality control laboratories receive a biennial laboratory inspection. Without a laboratory inspection, MDOT cannot ensure laboratories are maintaining accurate testing equipment or using the correct methods and equipment during testing.

Section 18.1485 of the *Michigan Compiled Laws* requires MDOT to establish and maintain a system of effective and efficient internal control techniques. MDOT's Materials Quality Assurance Procedures Manual (MQAP) requires MDOT to maintain a database containing the following information for quality assurance and prequalified suppliers' quality control laboratories:

- Laboratory name, address, and phone number.
- Contact information of laboratory supervisor and/or laboratory quality system manager.
- CFS Division laboratory reviews (for quality assurance laboratories only).

MQAP also requires the CFS Division to biennially evaluate quality assurance laboratories to ensure compliance with MQAP and the American Association of State Highway and Transportation Officials (AASHTO) R-18. The essential elements of AASHTO R-18 are setting up and implementing policies regarding equipment maintenance and calibration, technician qualification and continuing education, test results and document control, and corrective action.

The Manual requires that after prequalification approval, AQU must conduct quality control laboratory inspections biennially. The purpose of biennial inspections is to monitor the laboratories' adherence to the quality control plan, ensure the correct use of methods and equipment by technicians, and verify the maintenance of testing equipment.

Our review of biennial laboratory inspections disclosed MDOT did not:

- a. Maintain a list or database of quality assurance laboratories or prequalified suppliers' quality control laboratories.
- b. Always conduct required biennial inspections of the prequalified suppliers' quality control laboratories. Our random sample of 40 prequalified suppliers disclosed AQU did not conduct one or more biennial laboratory

At least one biennial laboratory inspection was not completed for 90% of the prequalified suppliers sampled.

inspections for 36 (90%) suppliers between October 1, 2018 and June 30, 2021. For the 36 suppliers, we noted:

- (1) 27 (75%) suppliers did not have any inspections between October 1, 2018 and June 30, 2021.
- (2) 9 (25%) suppliers had one inspection in 2021; however, the suppliers did not have inspections prior to 2021.

- c. Always conduct required biennial inspections of third-party laboratories that perform quality assurance testing on material from non-prequalified sources. We randomly sampled 50 MDOT construction projects awarded between October 1, 2018 and June 30, 2021 with aggregate used from non-prequalified sources. For 17 of the projects, MDOT used a third-party laboratory for acceptance testing at least once during the project. For 10 (59%) of the 17 laboratories, the AQU had not inspected the laboratory in the two years preceding the date of the quality assurance testing as required by MQAP.

Regarding part a., MDOT informed us it eliminated the requirement to establish and maintain the databases in the 2021 version of the MQAP because MDOT is migrating to a single unified repository. For parts b. and c., MDOT indicated the missing laboratory inspections resulted from a combination of military deployments, employee departures, and market shortage of qualified staff available to perform the functions of the work area.

We consider this finding to be a material condition because of the significant exception rates identified and the potential negative impact on the quality of construction projects.

## RECOMMENDATION

We recommend that MDOT improve its internal control to ensure all required quality assurance and prequalified aggregate suppliers' quality control laboratories receive a biennial laboratory inspection.

## AGENCY PRELIMINARY RESPONSE

MDOT provided us with the following response:

*MDOT agrees with the recommendation based on current requirements. However, the requirements are outdated and MDOT is working with FHWA to implement changes to the Procedures for Aggregate Inspection and the Materials Quality Assurance Procedures Manual, which will eliminate biennial inspections. In addition, as a result of staffing limitations in the aggregate area, MDOT allocated staff to areas deemed more critical than biennial inspections. The completion of biennial inspections was not a priority risk because QA testing and testing staff certifications are the primary controls.*

**AUDITOR'S  
COMMENTS TO  
AGENCY  
PRELIMINARY  
RESPONSE**

We agree MDOT's primary controls are QA testing and testing staff certifications; however, we noted exceptions related to both controls (Findings 2 and 5). Laboratory inspections become important to the process when the primary controls are not working as intended. Also, based on discussions with MDOT, it will remove the requirement for biennial laboratory inspections by AQU and instead will rely on the results of a national proficiency review of the laboratories.

## FINDING 4

### Improvements needed over PASP approval process.

MDOT did not always ensure aggregate suppliers met requirements prior to approval for PASP. Ensuring suppliers meet requirements increases the likelihood suppliers will detect non-specification aggregate prior to shipping and use on MDOT construction projects.

The Manual requires MDOT to complete an initial laboratory inspection for all suppliers applying for PASP. An initial laboratory inspection evaluates the suppliers' sampling procedures, scale equipment, and reduction, drying, and shaking methods. The Manual also requires PASP applicants to submit a quality control plan that includes the following elements:

- Production sampling frequency and location.
- Documentation of major events.
- Production of a control chart plotting quality control test results.
- Establishment of an action plan for producers and docks, concrete plants, and transfer points to be used when material is outside the warning band or specification limits.
- Plan to specify the load-out (shipping) sampling and testing frequency.
- Documentation of a retention policy with minimum retention of three years.

We sampled 14 suppliers prequalified from October 1, 2018 through July 30, 2021 and noted:

71% of suppliers' laboratories were not inspected and 50% of quality control plans were missing required elements.

- a. For 10 (71%) of the suppliers sampled, MDOT did not complete initial laboratory inspections.
- b. For 7 (50%) of the suppliers sampled, quality control plans did not contain one or more of the required elements, including:
  - (1) 2 (14%) did not include a sampling location.
  - (2) 7 (50%) did not include documentation of major events.
  - (3) 2 (14%) did not include load-out (shipping) sampling and testing frequency.
  - (4) 3 (21%) did not document their retention policy.

For part a., MDOT informed us the missing laboratory inspections were caused by military deployments, employee departures, and a market shortage of qualified staff available to perform the functions of the work area. For part b., MDOT's review of the

suppliers' quality control plans was not sufficient to detect the missing quality control plan elements.

We consider this finding to be a material condition because of the significant exception rates identified.

**RECOMMENDATION**

We recommend that MDOT ensure aggregate suppliers meet requirements prior to approval for PASP.

**AGENCY  
PRELIMINARY  
RESPONSE**

MDOT provided us with the following response:

*MDOT agrees with the recommendation based on current requirements. However, the requirements are outdated and MDOT is working with FHWA to implement changes to the Procedures for Aggregate Inspection and the Materials Quality Assurance Procedures Manual. In addition, as a result of staffing limitations in the aggregate area, MDOT allocated staff to more critical aggregate functions and tasks. The completion of initial laboratory inspections was not a priority risk because QA testing and testing staff certifications are the primary controls.*

*By April 1, 2023, MDOT will update procedures to include a quality control plan checklist and identify the area(s) responsible for review and completion of the checklist.*

**AUDITOR'S  
COMMENTS TO  
AGENCY  
PRELIMINARY  
RESPONSE**

We agree MDOT's primary controls are QA testing and testing staff certifications; however, we noted exceptions related to both controls (Findings 2 and 5). Laboratory inspections become important to the process when the primary controls are not working as intended.

## FINDING 5

### IATs not performed for all aggregate technicians.

MDOT did not always ensure all aggregate technicians who sample and test materials completed and passed an annual IAT. Without annual IATs, a risk exists that testing methodologies, equipment, and material used in MDOT projects are not consistent and reliable for use in quality assurance testing. This may cause aggregate used in MDOT projects to be outside of the specification requirements.

MDOT's MQAP requires technicians to complete an annual IAT for each aggregate test procedure they perform. IATs help ensure the technician's sampling procedures, testing procedures, and condition of testing equipment are appropriate.

We reviewed 50 MDOT projects awarded between October 1, 2018 and June 30, 2021 with aggregate used from at least one non-prequalified supplier requiring quality assurance testing. Of the 17 projects requiring technicians to have an annual IAT, MDOT did not complete annual IATs for a portion of the technicians on 6 (35%) of those projects.

MDOT informed us that, in some instances, region materials staff did not have accurate lists of project testing staff and, therefore, did not perform IATs.

## RECOMMENDATION

We recommend that MDOT ensure all aggregate technicians who sample and test aggregate materials complete and pass an annual IAT.

## AGENCY PRELIMINARY RESPONSE

MDOT provided us with the following response:

*MDOT agrees with the recommendation. MDOT has commenced implementation of a database and software solution called APCM for managing construction work completed by contractors. Record keeping of IATs and other field certification for construction staff was incorporated into APCM in December 2021. The incorporation of certification data (including IATs) into APCM will improve MDOT's ability to identify and obtain missing and expired certifications. The new process maintains records for access and review within APCM, and it provides a single repository for all certification information, which was not previously available. MDOT expects to start sending out IAT reports in April 2023.*

# SUPPLEMENTAL INFORMATION

UNAUDITED  
Exhibit 1

AGGREGATE QUALITY PROCESS  
Michigan Department of Transportation

MDOT Aggregate Supplier Sampling Frequencies  
As of June 30, 2021

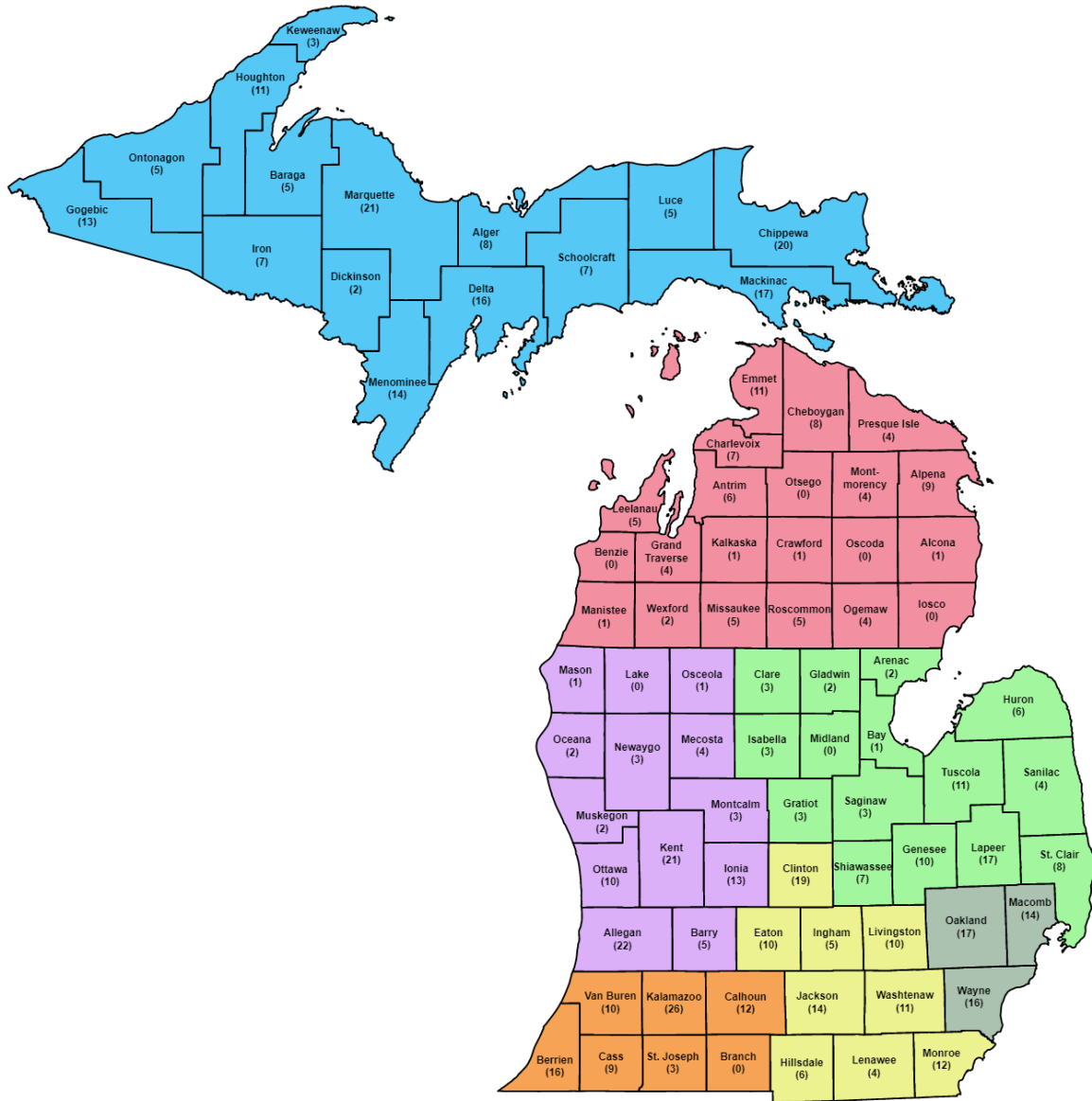
| Material Type and MDOT Standard<br>Specification Number for Construction | Basis of<br>Acceptance | Sample Frequency |                  | Sample<br>Size | Maximum Visual<br>Inspection<br>Quantity |
|--|------------------------|------------------|------------------|----------------|--|
|  |                        | Prequalified     | Standard         |                |  |
| Coarse Aggregate 902   | Test                   | 1 per 10,000 ton | 1 per 1,000 ton  | 50 pounds      | 100 ton                                  |
| Dense-Graded Aggregate 902   | Test                   | 1 per 10,000 ton | 1 per 1,000 ton  | 50 pounds      | 500 ton                                  |
| Open-Graded Aggregate 902  | Test                   | 1 per 10,000 ton | 1 per 1,000 ton  | 50 pounds      | 100 ton                                  |
| Granular Material Class I 902  | Test                   | 1 per 10,000 ton | 1 per 1,000 ton  | 50 pounds      | 100 ton                                  |
| Granular Material Class II (Subbase),<br>Class IIA, Class IIAA 902       | Test                   | 1 per 10,000 cyd | 1 per 3,000 cyd  | 50 pounds      | 500 cyd                                  |
| Class II (Abutment B, F) 902   | Test                   | 1 per structure  | 1 per structure  | 50 pounds      | 100 cyd                                  |
| Granular Material Class III 902  | Test                   | 1 per 30,000 cyd | 1 per 10,000 cyd | 50 pounds      | 500 cyd                                  |
| Granular Material Class IIIA 902   | Test                   | 1 per 3,000 cyd  | 1 per 1,000 cyd  | 25 pounds      | 100 cyd                                  |
| Fine Aggregate   | Test                   | 1 per 10,000 ton | 1 per 1,000 ton  | 25 pounds      | 100 ton                                  |

cyd = cubic yard.

Source: This exhibit was created using MDOT's Procedures for Aggregate Inspection Manual.

AGGREGATE QUALITY PROCESS  
Michigan Department of Transportation

Map of Aggregate Suppliers  
As of January 28, 2021



● Bay Region (80) ● Grand Region (87) ● Metro Region (47) ● North Region (78) ● Southwest Region (76) ● Superior Region (154) ● University Region (91)

To view the interactive map: <https://audgen.michigan.gov/591-0420-21-map-aggregate-suppliers-exhibit-2/>

Source: The OAG created this map using data from MDOT.



## PROGRAM DESCRIPTION

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MDOT is responsible for the 9,649 miles of Michigan's State highway system composed of all M-numbered, Interstate, and U.S. numbered highways. MDOT has seven regional offices with several transportation service centers that handle transportation-related construction, maintenance, and programs within the region's geographic boundaries. MDOT's AQU, located within the CFS Division, works with the regional offices and transportation service centers to ensure aggregate material used in construction projects meets quality and specifications. MDOT's mission\* is to provide the highest quality integrated transportation services for economic benefit and improved quality of life. The CFS Division provides specialized engineering expertise to the regions and other divisions and maintains AASHTO-accredited testing laboratories for all types of highway materials.

MDOT uses aggregate as the base material for asphalt and concrete and used it to compose roadbed, shoulder, and other earthworks for a given project. AQU assigns each aggregate supplier an aggregate source inventory (ASI) number for MDOT to track the material from origin to application. AQU maintains a list of all aggregate suppliers, including prequalified aggregate suppliers.

As of January 28, 2021, MDOT had 613 aggregate suppliers (see Exhibit 2), and as of June 21, 2021, 237 were prequalified.

\* See glossary at end of report for definition.

## AUDIT SCOPE, METHODOLOGY, AND OTHER INFORMATION

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### AUDIT SCOPE

To examine MDOT's aggregate quality process and related records. We conducted this performance audit\* in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

As part of the audit, we considered the five components of internal control (control environment, risk assessment, control activities, information and communication, and monitoring activities) relative to the audit objectives and determined all components were significant.

### PERIOD

Our audit procedures, which included a preliminary survey, audit fieldwork, report preparation, analysis of agency responses, and quality assurance, generally covered October 1, 2018 through June 30, 2021.

### METHODOLOGY

We conducted a preliminary survey of the aggregate quality process. During our preliminary survey, we:

- Interviewed MDOT management and staff regarding their functions and responsibilities.
- Reviewed applicable State laws, policies, procedures, and manuals to identify aggregate requirements and processes.
- Obtained an understanding of MDOT's processes and internal control related to:
  - Review and approval of prequalified aggregate suppliers.
  - Management of the Aggregate Supplier Program.
  - Tracking of aggregate suppliers' weekly shipments.
- Performed limited testing of aggregate suppliers approved for prequalification between October 1, 2018 and June 30, 2021.
- Visited three MDOT construction sites and four aggregate sources to gain a further understanding of MDOT's aggregate processes.

\* See glossary at end of report for definition.

## **OBJECTIVE 1**

To assess the sufficiency of MDOT's efforts to ensure aggregate quality.

To accomplish this objective, we:

- Conducted site visits of three MDOT construction projects and four aggregate sources.
- Randomly sampled 50 of 2,167 MDOT projects awarded during our audit period to determine whether:
  - Non-prequalified aggregate accepted for a project was tested at the appropriate frequency and had required physical property tests.
  - Certified MCATs performed quality assurance testing for aggregate supplied on MDOT projects.
- Randomly sampled 40 of 320 suppliers that were part of PASP during our audit period to determine whether:
  - The aggregate was tested at the required frequency and had required physical property tests.
  - Certified MCATs performed quality assurance testing for aggregate supplied on MDOT projects.

We used random samples to eliminate any bias and enable us to project the results into the population.

## **OBJECTIVE 2**

To assess the effectiveness of MDOT's efforts to administer the Aggregate Supplier Program.

To accomplish this objective, we:

- Randomly and judgmentally sampled 14 of the 139 prequalified aggregate redistribution points and prequalified supplier sources approved for prequalification between October 1, 2018 and July 31, 2021. Our review was designed to verify MDOT completed the following requirements prior to acceptance into the Aggregate Supplier Program:
  - Physical property tests were completed as required.
  - Designated MCATs were appropriately certified.
  - Quality control plans contained all required elements as identified in the Manual.

- Initial supplier laboratory inspections were completed or laboratories were accredited by AASHTO.
- Randomly sampled 25 of the 262 records from the IAT database from January 1, 2019 through April 30, 2021 to verify MDOT properly completed IATs and the database was accurate.
- Randomly sampled 40 of 320 suppliers in PASP during our audit period to determine whether:
  - MDOT conducted biennial laboratory inspections.
  - MCATs who performed aggregate quality assurance testing on aggregate supplied to MDOT projects passed an annual IAT.
- Randomly sampled 50 of 2,167 construction projects awarded during our audit period to determine whether:
  - MDOT conducted biennial laboratory inspections of third-party laboratories who performed quality assurance testing on non-prequalified aggregate supplied to an MDOT project.
  - MCATs who performed aggregate quality assurance testing on aggregate supplied to MDOT projects passed an annual IAT.

We used random samples to eliminate any bias and enable us to project the results to the populations. Our judgmental sample was selected based on risk. For our judgmental sample, we could not project the results to the respective populations.

## **CONCLUSIONS**

We base our conclusions on our audit efforts and any resulting material conditions or reportable conditions.

When selecting activities or programs for audit, we direct our efforts based on risk and opportunities to improve State government operations. Consequently, we prepare our performance audit reports on an exception basis.

## **AGENCY RESPONSES**

Our audit report contains 5 findings and 5 corresponding recommendations. MDOT's preliminary response indicates it agrees with all of the recommendations.

The agency preliminary response following each recommendation in our report was taken from the agency's written comments and oral discussion at the end of our fieldwork. Section 18.1462 of the *Michigan Compiled Laws* and the State of Michigan Financial Management Guide (Part VII, Chapter 4, Section 100) require an audited agency to develop a

plan to comply with the recommendations and to submit it to the State Budget Office upon completion of an audit. Within 30 days of receipt, the Office of Internal Audit Services, State Budget Office, is required to review the plan and either accept the plan as final or contact the agency to take additional steps to finalize the plan.

**SUPPLEMENTAL  
INFORMATION**

Our audit report includes supplemental information presented as Exhibits 1 and 2. Our audit was not directed toward expressing a conclusion on this information.

## GLOSSARY OF ABBREVIATIONS AND TERMS

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|  |   |
|--|---|
| <b>AASHTO</b>  | American Association of State Highway and Transportation Officials.   |
| <b>aggregate</b>   | A produced product having specific physical and gradational properties and is created by manipulation of material through a processing operation. The material may be from natural sand and/or gravel deposits, quarried bedrock, slag from steel mills or copper refineries, debris from mining operations, or crushed Portland cement concrete.   |
| <b>APCM</b>  | AASHTOWare Project Construction and Material.   |
| <b>AQU</b>   | Aggregate Quality Unit.   |
| <b>ASI</b>   | Aggregate Source Inventory.   |
| <b>auditor's comments to agency preliminary response</b> | Comments the OAG includes in an audit report to comply with <i>Government Auditing Standards</i> . Auditors are required to evaluate the validity of the audited entity's response when it is inconsistent or in conflict with the findings, conclusions, or recommendations. If the auditors disagree with the response, they should explain in the report their reasons for disagreement. |
| <b>CFS</b>   | Construction Field Services.  |
| <b>effectiveness</b>                                     | Success in achieving mission and goals.   |
| <b>efficiency</b>  | Achieving the most outputs and the most outcomes practical with the minimum amount of resources.  |
| <b>Independent Assurance Test (IAT)</b>                  | A test conducted to evaluate both the aggregate technician's sampling and testing procedures and the condition of the testing equipment. The initial sample is split into two halves. One half is tested by the technician and the other half is tested by the independent assurance inspector.   |
| <b>internal control</b>                                  | The plan, policies, methods, and procedures adopted by management to meet its mission, strategic plan, goals, and objectives. Internal control includes the processes for planning, organizing, directing, and controlling program operations. It also includes the systems for measuring, reporting, and monitoring program performance. Internal control serves as a defense in           |

safeguarding assets and in preventing and detecting errors; fraud; violations of laws, regulations, and provisions of contracts and grant agreements; or abuse.

**Los Angeles (LA) Abrasion test**

A test to evaluate the aggregates for resistance to abrasion.

**Manual**

MDOT's Procedures for Aggregate Inspection Manual.

**material condition**

A matter that, in the auditor's judgment, is more severe than a reportable condition and could impair the ability of management to operate a program in an effective and efficient manner and/or could adversely affect the judgment of an interested person concerning the effectiveness and efficiency of the program. Our assessment of materiality is in relation to the respective audit objective.

**MDOT**

Michigan Department of Transportation.

**Michigan Certified Aggregate Technician (MCAT)**

Qualified aggregate testing technicians who possess a current certification appropriate for the material class being tested.

**mission**

The main purpose of a program or an entity or the reason the program or the entity was established.

**MQAP**

Materials Quality Assurance Procedures Manual.

**performance audit**

An audit that provides findings or conclusions based on an evaluation of sufficient, appropriate evidence against criteria. Performance audits provide objective analysis to assist management and those charged with governance and oversight in using the information to improve program performance and operations, reduce costs, facilitate decision-making by parties with responsibility to oversee or initiate corrective action, and contribute to public accountability.

**Prequalified Aggregate Supplier Program (PASP)**

A partnership between MDOT regional offices and aggregate suppliers, exchanging documented quality control and certified testing personnel by suppliers, for a reduction in acceptance testing and increased failing material resolution from AQU.

**QA**

quality assurance.

**reportable condition**

A matter that, in the auditor's judgment, is less severe than a material condition and falls within any of the following categories: a deficiency in internal control; noncompliance with provisions of laws, regulations, contracts, or grant agreements; opportunities to improve programs and operations; or fraud.











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